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A short article in this issue describes the methods used in applying a new deck to a viaduct with the use of a derrick car. A distinctive feature of this work was that the deck was assembled in units of 14-ft. lengths, thereby effecting a considerable reduction in the amount of work to be done by hand labor after the timbers were in place on the girders. The plan, as carried out on this work, implied the restriction of traffic to one of the two tracks on the bridge while the work was in progress, and, of course, the possibility of arranging the program in this way added greatly to the opportunity for effecting economies. Maintenance officers have frequently experienced difficulty in securing any concessions of this nature from the operating department, with the result that they are compelled to revert to much less efficient methods in carrying out renewal work. With the use of power equipment the opportunities for economical performance become so great that much more weight is added to the argument for uninterrupted possession of the track while the work is in progress.

An Example of Labor Saving

A short account is given in this issue of the troubles experienced recently at a water station, which were found upon investigation to result from the contamination of the supply by a large coal storage pile. This is an excellent illustration of the necessity for the right kind of supervision over railway water supplies. Training in the school of experience is excellent and most essential, but in the absence of technical knowledge it will not fulfill the requirements when attacking a problem not previously encountered. As it happens, the chemical process responsible for the difficulty in this particular case is readily understood, once the matter had been analyzed. The water at this station was naturally a carbonate water, which produces a rather soft deposit in the boilers. The presence of the coal pile resulted in the dissolving of considerable quantities of sulphur compounds from the coal that were carried into the ground where they came in contact with the carbonate water and changed the carbonate to sulphate, which produces a very objectionable scale. Simple as this explanation may be, it required the services of a chemist to solve the difficulty.

An Unusual Problem in Water Service

Much has been heard in recent years about the necessity for the conservation of timber and some have interpreted this to mean the universal substitution of other construction materials for wood. This is not conservation in its broad sense, neither is it good engineering practice. As with any of the other materials of recognized value, there are certain purposes for which wood is better fitted than any other material and obviously its use should be continued here. There are other applications where concrete, steel or other materials are better or more economical, and it is self-evident that the continued use of wood in such places is bad practice. There are still other fields where two or more materials may be equally suitable and considerations of economy should then prevail. Economic comparisons change from time to time, and these changes

The Conservation of Timber

have come with startling rapidity in recent months. The development in the art of timber preservation has done much to broaden the field for the economical use of wood, while the rapid increase in the use of cement immediately preceding the war resulted in lowering the price and increasing the availability of this material. During the last two years the most marked development has been the rapid increase in the price of steel in comparison with the cost of competing materials. Conservation implies the use of each of these materials in the place for which it is best fitted and for which it is most economical, proper measures then being taken to secure the maximum service from each of the materials in their proper uses through observance of the rules of good practicc.

THE PROBLEM OF THE FOREMAN

THE FOREMEN ARE the nuclei around which the maintenance of way organization is built. The efficiency of the department may be measured almost directly by the ability and energy displayed by these men. They are in immediate charge of all work done in the field and it is under their supervision that the railroads' money is spent.

Upon these men, therefore, rests a heavy responsibility at the present time. Their forces have declined in efficiency for a number of reasons. For a time it was impossible to secure an adequate number of men and this led to a marked deterioration in the character of service rendered by those who were employed, a condition which has improved somewhat in recent weeks, but is still far from satisfactory. The large number of inexperienced men who have been employed is also a drain on the output of a gang. The delay in the receipt of ties and other materials has disarranged the season's work. All of these conditions have added to the difficulties of properly conducting maintenance work and they tax the ability and resourcefulness of the foreman.

THE VALUE OF A MAINTENANCE DOLLAR

THE RAPIDLY declining value of the dollar as a purchasing medium is shown strikingly by a comparison of maintenance of way expenditures at the present time with those of a few years ago. As pointed out in another column, these expenses on the roads under federal control for the first five months of 1919 aggregated $304,441,957, or an increase of 38 per cent over the evpenditure of $220,567,840 in the corresponding period of 1918 and 88 per cent over the average expenditure of $161,740,000, recorded for the same months of the test period.

While on their faces these figures indicate greatly increased activity, those familiar with actual conditions on the roads are practically a unit in feeling that this increase in dollars is meaningless in view of the heavy increases in unit costs of all kinds, and that, measured in terms of work done, this apparent increase is converted into an actual decrease.

Take the cost of track labor as an example. The hourly wage of track labor has been doubled in the last 18 months so that the return per dollar of expenditure has been cut in half. The reduction in the number of working hours per day from 10 to 8 has resulted in a still greater decrease in the output of productive work for a certain amount of time is lost in such unproductive activities as going to and from work, etc., regardless of the length of the working day and the percentage which this time bears to the total time worked increases as the number of hours worked per day decreases. Further, on most roads, the efficiency of track labor has risen considerably in recent months from the low level of last year, it is still far below that of the earlier years of the test period which influence is evident in the comparative output of work.

Taking all of these influences into consideration it is safe to assume that the return in constructive labor per dollar expended in track work is not over 35 per cent of that of three or four years ago. This is one reason why maintenance expenditures have risen so rapidly without a corresponding improvement in the condition of the properties.

THE UNREST IS UNIVERSAL

THERE IS MUCH food for serious consideration in the discussion of the general unrest which now prevails among section foremen, appearing on another page. The services of this class of railway employees is indispensable to the roads. They hold positions of responsibility and trust. Their working conditions leave some things to be desired. They are underpaid in comparison with employees in certain other departments. All these complaints may be recognized as having merit, yet they apply with equal truth to many employees in numerous other branches of railway service. Neither are these conditions confined to the transportation industry for the unrest is general in almost all industries today. The abnormal times through which we have been and still are passing have rendered obsolete all our previous standards of comparison in wages and in living expenses. We are without the mile posts which have guided us in the past. This more or less chaotic condition is a result of the upheaval in industrial life brought about by the recent world conflict.

It will require time for all of these things to be adjusted properly. Although seemingly slow, progress is being made. Because of their long record of loyal service to their roads no group of employees stands higher in the estimation of railway officers than the section foremen and these officers will take the first opportunity to correct the more or less unsatisfactory conditions which now prevail.

GIVE THE TOOLS A CHANCE

GOOD TOOLS ARE the best assistants for competent workmen. At the same time they must be used intelligently and with a knowledge of their limitations if they are to render their maximum service. The best tool can be ruined by abuse, while the service of even a poor tool can be increased greatly by using it properly.

There is no economy in using poor tools, for the saving in first cost is offset many times by their decreased life and increased cost of repairs, by the loss of time by workmen, and by the greater liability for accident, etc. However, even the best tools can be ruined by careless or unintelligent use. The ways in which track chisels are commonly abused are illustrated on another page. Other tools are similarly mistreated on almost every road.

The amount of money a road ties up in the tool equipment for its maintenance of way gangs is sufficiently large to warrant it in giving serious consideration to means of securing the largest returns from this investment. When a road makes an outlay for good equipment of this character it should take other steps to see that the tools so purchased are used only in the proper manner.

Some abuse results from deliberate carelessness or indifference on the part of the workman. Educational measures will help here, supplemented by discipline where necessary. More abuse results from ignorance or thoughtlessness and this can be corrected in large measure by instruction and training, particularly if the workman

can be shown that it is to his advantage as well as that of his employer to adopt the proper method. Thus when a workman learns that it not only increases the life of a chisel to hold it properly, but decreases the danger of accident to himself, he has a double interest in extending his co-operation.

Manufacturers have long complained, and with much justice, that the roads, after buying their tools, have failed to give them the proper chance to render the full service of which they are capable by not insisting that they be used properly. If the manufacturers of a few tools can afford to send men from gang to gang on a road to instruct these men in the proper use of their tools as a means of increasing their service and securing repeat orders, it would seem that the roads can even better afford to instruct their men in the use of all the tools which they use. This form of instruction would appear to be particularly necessary at the present time following a period of rapid turn-over in the maintenance forces with the resultant preponderance of inexperienced men.

WILL IT PAY TO INCREASE THE STRENGTH OF THE TRACK STRUCTURE?

THERE IS MUCH food for thought in the article on concrete roadbed construction which appears on another page of this issue. Many engineers responsible for track maintenance have frequently asked themselves whether the railway track structure should not be more substantial than it is now built, not primarily to increase the safety of traffic but to obtain the greatest ultimate economy. The most common object lesson in any consideration of this subject is the heavy construction provided for street car traffic in large cities. Not only are the ties commonly imbedded in concrete and covered by a stiff pavement but the rails weigh as much as 135 lb. per yard. Yet the wheel loads are only a small fraction of those imposed by the steam road traffic. This policy has been justified by one very severe condition imposed in the operation of the railways in city streets—there can be no track maintenance in the sense in which this term is understood in ordinary ballasted track.

The article on concrete roadbed records favorable performance for the installations described, some of which have seen long service. However, it is but fair to note that most of the cases concern tracks with moderate speed traffic. (The Long Island design described does not expose the concrete to the direct impact of the rail.) Still, the success of the installation warrants serious study from the standpoint of possible application to at least the heavy traffic lines of this country.

As with all other problems involving a commercial undertaking, the question resolves itself into one of cost—daily or annual cost. This is composed of three elements: (1) interest on the original investment, (2) current maintenance and (3) sinking fund to renew. In railway accounting the last two items are combined—renewals become a part of the maintenance and should not be overlooked in estimating the maintenance item. The first cost is the most perplexing, both in considering the building of a new line and the replacement of ordinary track construction on an operated line. In the one case, there is the question of subsidence on high embankments before installing the concrete slab. In the other there is the problem of maintaining traffic while the existing track structure is entirely removed so that it may be replaced by something new.

In estimating the saving in maintenance it is especially important not to overlook those items of the present cost of maintenance of way which are not eliminated by the introduction of the stronger structure, and foremost among these is the matter of rail renewals. Until specific data are available it would seem unwise to assume too optimistic an attitude in regard to this factor. It is to be conceded that the present form of track construction as used on steam railroads falls far short of the ideal, but experience has shown that plans for greatly increasing the cost of any item in the railroad plant cannot be consummated without conclusive demonstrations of economy.

THE RAILROAD ADMINISTRATION AND MAINTENANCE

THE RAILROAD ADMINISTRATION has been giving serious consideration to maintenance of way matters during the last few weeks. It had given little attention to maintenance subjects other than in a general supervisory way until late in May when it suddenly became impressed with the idea that it was in danger of exceeding its contractual obligations. This led to the issuance of the drastic order on May 27 limiting maintenance of way expenditures to the ratio to operating revenues which these expenditures bore to operating revenues during the test period. This order came as a surprise to all and required a heavy curtailment in work on almost all roads regardless of the then existing condition of the properties or the amount of work already completed. It forced the laying off of large numbers of men, individual roads letting as many as two thousand men go in some instances. This retrenchment was particularly serious since it came at the time of greatest activity and opportunity for productive work. While this order has since been modified materially in its application to the remainder of the calendar year, it still stands as a restraining influence on maintenance work and it is seriously limiting the activities in this field, with the result that the amount of maintenance work which will be done will fall considerably short of earlier plans.

The issuance of these instructions has had one marked effect in that it has forced the roads and the government to collect information regarding the work which had already been done, a thing which should have been undertaken a year ago but was not. The determination as to what constitutes compliance with the terms of the contract between the government and the carriers is neither simple nor easy. The world war has removed our long established bases of comparison and it is necessary to develop new and more detailed units. It is to be regretted that the collection of data preliminary to the development of these units was not undertaken in the early days of federal control, instead of waiting for the concluding months, for the information now collected will be available so late that it will be largely in the nature of a post-mortem. Neither the government nor the roads desire the exchange of money in the final settlement for maintenance for both are agreed that the condition to be desired is the complete fulfillment of the contract requirements.

It is therefore now highly important that even at this late date every effort be made to arrive at an early agreement regarding the present condition of the properties in order that the roads and the government may come out even at the end of the period of federal control. In the mean time, the present retrenchment constitutes a menace on many roads for the time now being lost cannot be recovered later in the year and the tracks will inevitably go into the winter in a deteriorated condition which will add to the cost of operation of the roads after they are turned back to their owners on January 1.

THE USE AND ABUSE OF THE TRACK CHISEL

The Right Way
Chisel Used to Split the Nut Off the Bolt

The Wrong Way
Chisel in Contact with the Nut Lock

Some Suggestions on the Proper Handling of This Simple But Important Tool

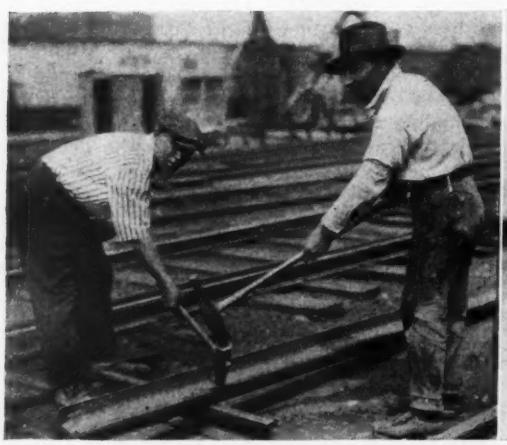
BY HOWARD C. MULL,
Sales Agent, Verona Tool Works, Chicago, Ill.

THE RAILROADS of this country invest almost one-half a million dollars each year in track chisels. It is clear, therefore, that any improvement in the handling of this most simple of all tools, which would result in any appreciable increase in their life, would effect a considerable saving. One not informed would noturally suppose that the use of a track chisel is so simple that there would be no question about its being done properly. On the contrary, it is the most abused tool used on railroads and there is a wonderful opportunity for accomplishing an increase in the life of track chisels by encouraging their proper use through adequate instruction. Nor is the question one of economy alone. Reliability of the chisel is of no small importance. Many times have the schedules of trains been upset by the failure of a track chisel when it was necessary to cut a rail to let a train through. It is not the sense of this article that inferior tools may be made to do good work if properly handled, but it is the idea that a good tool may have its service life practically doubled if used only in the proper manner.

In the first place, a chisel must be fitted with a good tight handle so that it is fairly under the control of the man who holds it. However, a good handle is of no value unless proper use is made of it. In other words, it must be held firmly with both hands so as to insure a proper position of the point and a fixed position of the head to give the striker a fair chance to hit it squarely. If a blow is struck while the chisel is making a turning movement, it will generally cause the point to chip out or break.

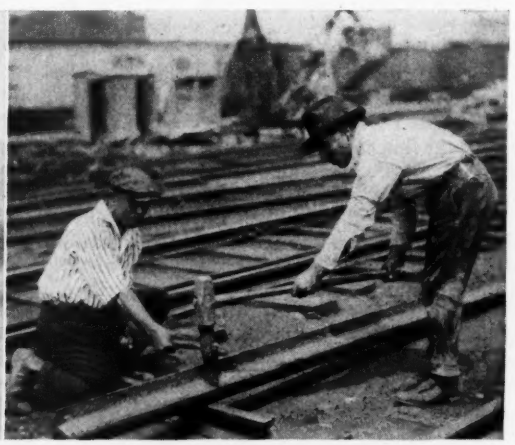
Another important point is that the striking hammer should have a large enough face to cover the head of the chisel properly, a 10-lb. sledge is the most suitable. A spike maul should never be used. The head of the chisel is generally larger than the striking face of a spike maul and there are very few men who can strike a true blow with a maul so that it will hit the chisel squarely every time. A slanting blow or one near the edge or corner of a chisel is almost sure to prove disastrous to the chisel point, while the continual hammering of a small maul head on the larger head of the chisel results in digging the head of the chisel to pieces so that it will give only about one-half the service that would be the case if a 10-lb. sledge had been used. Another objection to the use of the maul is the fact that this kind of service greatly shortens the life of the maul also. Continual striking of the hammer head against the chisel head makes the latter practically as hard as the face of the hammer. When the spike maul with its small face is used on the hardened head of a chisel, it means that something must give way and the result is that the spike maul becomes battered long before it should had it been used for driving spikes only. In a recent test one chisel was given a total of 3,500 blows with a sledge without redressing the head or grinding the cutting edge of the chisel. Had a maul been used instead it would have been impossible to give the chisel over 1,500 blows before it would have been necessary to redress the head so as to take off the ragged edge.

When starting to cut a rail it is not necessary to drive



The Wrong Way
Using a Maul on a Chisel Held Indifferently

A Poorly Ground Chisel
Point Is Unsymmetrical

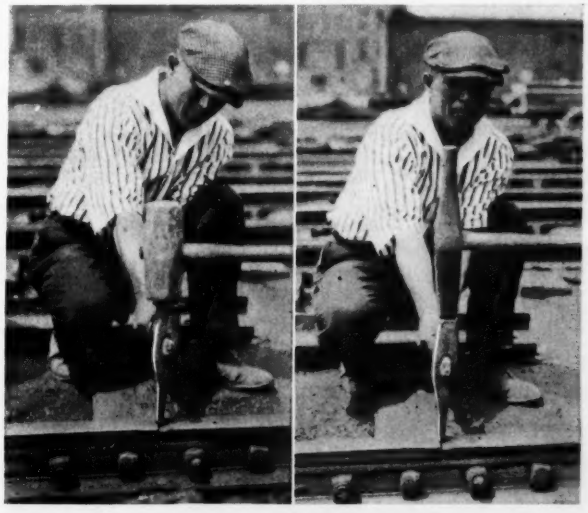


The Right Way
Using a 10-lb. Hammer on a Chisel Held Correctly

the chisel entirely through the rail at the first blow. As is well known, the top of the rail head after being subjected to the cold rolling process of traffic becomes much harder than the rest of the rail. Consequently it is particularly hard on the chisel edge. Strike the rail lightly until a good cut is started. After that you can go after it just as hard as you like. After a cut has been formed the effect of the hammer blow does not come entirely on the edge of the chisel, but is distributed largely over the supporting surfaces on either side.

It is also necessary to start the cut properly. The writer has seen a good many track men start a cut by making a series of small separate nicks all the way around the rail and then attempt to connect up these nicks by other short cuts between them. This often results in breaking the point of the chisel since it is next to impossible to get all the short nicks in a straight line. The result is that a crooked line is formed which sets up irregular pressures on the chisel as it is driven down. The proper method to start a cut of this kind is to move the chisel forward progressively in a straight line from the first cut.

A chisel may be readily spoiled in regrinding the point. Care should be used to see that both sides are ground to the same radius. If one side is ground short and the other long the strain is thrown on one side of the chisel. A chisel should always be given a curved edge like that on a new chisel. It should never be ground so that the cutting end is square as on a cold chisel. If it is, the ends are sure to break off. Do not attempt to draw the chisel too thin. Remember that you are cutting steel and not wood. A blow from a 10-lb. hammer in the hands of a strong man is terrific and the metal must be equally distributed and properly supported on each side if it is to withstand the shock. On the other hand, this idea must not be overdone. The action of the chisel must be



Use a Worn-out Chisel, Not a New One, to Drive Expansion

that of a cutting tool rather than a wedge and the taper of the point should extend from the eye in order to make a good, clean cut.

The points of chisels are very carefully tempered by the manufacturer. Consequently, it is necessary to avoid overheating the point when grinding them, as could be very easily done if an emery wheel was used. The result would be a soft tool that would mash down and be useless until redressed and tempered. The best results are secured on a wet grindstone. In redressing the chisel care must be taken to see that the tool is given a soaking heat. If it is heated too quickly the effect will be to lap the hot steel on the outside over the cold steel on the inside, causing the chisel to open up under the first blow of the hammer. High carbon steel like that used in chisels when properly tempered for use is very brittle when cold, that is, in a temperature below the freezing point of water. When chisels are to be used in cold weather they should be dipped in water to "take the frost out" before using.

Many chisels are spoiled by attempting to use them

Examples of Chisel Heads Battered by Spike Mauls

for purposes for which they are not suited. A track chisel is a *chisel*, not a wedge, and any attempt to use it as a wedge is almost sure to break the cutting end. A good chisel should never be used for driving expansion in rails. It would be just as bad to put the tempered point of a chisel in a vise and strike it on the side of the head. The effect on the chisel will be the same, a broken tool. Save worn out chisels for this work. In the same way, a chisel should not be used as a wedge between the nut and the face of the angle bar to cut off a bolt. A track chisel is not a proper tool for this purpose, but still it is a necessary work and if it must be done it is preferable to split the nut in two, and even then care must be taken not to use the chisel as a wedge in prying the nut off the bolt after the nut has been split. Where nut locks are used care should be taken that the cutting end of the chisel never comes in contact with them. Chisels will always chip out when put on a nut lock for the reason that nut locks are made of a higher carbon steel and tempered harder than the cutting ends of chisels. A good chisel if properly used will last a good while, but if improperly used a dozen may be used up in cutting off one rail.

THE AUSTRALIAN GAGE PROBLEM*

THREE GAGES are in use for main line traffic in Australia—5 ft. 3 in., 4 ft. 8½ in. and 3 ft. 6 in.—and these are so unequally distributed that most inter-capital journeys involve at least one change of train, while an East-West tour between Brisbane and Fremantle via the new Trans-Australian Railway includes no fewer than six "gage-sections." To unify the gage throughout Australia will involve the conversion of over 12,250 miles of 3-ft. 6-in. track and 6,356 miles of 5-ft. 3-in. out of a total mileage of nearly 26,000.

Proposals for laying a third rail merely relieve the situation as between two gages, and that only partially, seeing that whereas an additional rail can be placed between two of a wider gage (though space available with 4-ft. 8½-in. and 5-ft. 3-in. lines is somewhat restricted for switches, crossings, signal appliances, etc.,), a new outside rail on a narrower gage line will in most cases require entire relaying with longer ties, even although alterations may not be required at stations, bridges, etc.

In order to investigate possibilities of alleviating the

*Abstracted from the Railway Gazette (London), April 18, 1919.

present situation a special board of railway engineers was appointed recently to inquire into inventions and proposals for overcoming the break of gage difficulty; 126 suggestions were considered, of which 102 were rejected as not complying with the conditions, one was withdrawn, and no definite decision was given in regard to the remainder in the absence of complete particulars, presumably because of the necessity for working out in detail required for practical adoption. The report virtually amounts to an expression of opinion that no effective solution of the difficulty is afforded by any of the methods suggested; but strongly dissentient views are expressed by two other railway engineers to whom the report was submitted.

SUPERVISION REQUIRES ORGANIZATION

BY F. J. MEYER

Roadmaster, New York, Ontario & Western, Walton, N. Y.

PROPER SUPERVISION is so dependent on proper organization that it is difficult to obtain the one without the other. Proper organization means, not only that individual units which compose the organization are in their proper places, moving with clock-like precision, but that unlike a clock they constitute an animated body, honest, loyal, full of energy, with the one desire to produce more and then more. As supervision in the maintenance of way department is partly dependent on organization, the prime factors which effect present day supervision can only be comprehended when the causes underlying present day methods are understood.

Generally speaking, American railroad organizations were patterned after the organization of the United States army. Probably during the earlier days of railroading no better organization was obtainable. The maintenance forces were pioneers fighting the elements. The track attracted the best men in the country and the trackmen compared very favorably with those who entered the other departments. It was no mean position to be a section boss. A section foreman was not only looked on as one of the big men in the community but he assumed and was expected to assume a sort of proprietorship over the property of the railroad entrusted to him.

Many of the earlier section foremen joined the roads during the construction days and were selected after construction was completed because of their peculiar fitness. The tracks were new, equipment light, speed not great, the public not exacting. Maintenance consisted far more in keeping the road open in earlier times than in trying to obtain that quality of track so desirable today. Bad spots, broken rails, slides and washouts were the chief concern. The foreman's superior officer was often an operating man who, while able to locate trouble, could not apply the remedy. Of course ditching and rough surfacing did not require the same close supervision as the work now done on the track. As traffic increased, as rolling stock grew heavier, the track was improved until the American railroads stand today without a peer in all the world. During the period when the tracks were being brought to their present high standard, when the most able of the track foremen were being made road-masters and supervisors, the wages of maintenance men did not keep pace with the wages paid in other branches of the service and it was the exception rather than the rule to get the same high grade of trackmen as before. There was, however, enough of the better talent left to permit much of the same kind of supervision as was used with success in the pioneer days.

Times have now changed. The track standard is high. Wages are high. Material is very expensive and as in the case of ties often inferior in quality. Moreover there are quite a few inexperienced foremen and many new men. The inexperienced foreman is expected and must carry on from where the veteran leaves off. He does not have the opportunity to learn and grow with the traffic as did the earlier trackman but must learn rather by educational means and by observation. The inexperienced foreman directs work only with difficulty. Misguided effort is not only costly but creates much dissatisfaction. Confronted with these conditions the supervising forces should be in the closest possible contact with their men. Supervision from the rear end of a train no longer produces satisfactory results.

The roadmaster or supervisor does not hold the position of critic. He is a builder and maintainier. Close contact with the men in the field requires a freedom from office duties which many men say take much of their time. Office duties may interfere with the outside work of many roadmasters and supervisors but as a general rule if the supervising forces get out with the men and stay close to them the office work is reduced automatically. Letters and circulars would be less frequent. Reports would of course be better and less numerous because the foremen would see their superiors more often.

It may seem that fewer letters and circulars would work a greater relief to the clerical forces than it would to the supervising forces but that, however, seems hardly to be the case. A foreman's letter should be answered by his superior, not by a clerk. In the usual sense it almost seems that the day of the roadmaster's clerk is past and the time has arrived for a roadmaster's assistant. This of course is not the clerk's fault but it is rather due to the fact that the clerk has always been looked on as a bookkeeper and has not been given an opportunity to get out and learn more of the practical end of the game. Real accounting is seldom done in the roadmasters or supervisor's office, for in a strict sense time keeping, distributing labor and making material reports is not accounting. It is record and report writing.

This question has not been raised with the idea of belittling the work of the many able and faithful clerks now in the service but rather to point out the fact that many of the present clerks are capable of being used for more responsible duties and where they are not, a roadmaster or supervisor could use a man from the track or from the engineering forces as an assistant to far better advantage.

Pre-supposing that the organization is all that can be desired and that the supervising forces are well satisfied, which by the way is absolutely necessary to good supervision, these forces should be in the closest touch with the men whose work they supervise. The means of getting over the road are many, trains, motor cars and the never-to-be-discarded walking. It is not such a difficult matter to give maintenance work proper supervision. Rather it is more a matter of getting right down to it.

The present high costs of labor and materials are rapidly introducing more permanent materials. High wages should improve the calibre of the maintenance forces. High costs can only be offset by increased efficiency. Increased efficiency can only be obtained by the forces getting down next to the ground—teaching, directing and correcting.

DISCUSSION OF TIE PURCHASING METHODS

Producers Present Brief Which Leads to Interesting Correspondence With Administration

THE CENTRALIZATION of the purchase of cross-ties for all the railroads under Federal control in the hands of the Division of Purchases of the United States Railroad Administration has resulted in the introduction of many radical changes in the methods of producing and selling ties. For the purpose of presenting the views of the tie producers to the Division of Purchases a committee from the National Association of Railroad Tie Producers waited upon the director of the Division of Purchases on April 15 and presented recommendations which have recently been made public. An abstract of this brief and of the correspondence which followed is given below:

THE TIE PRODUCERS' BRIEF

The more reputable tie producers have always agreed upon the necessity and desirability of both standard specifications and standard inspection for controlling the purchase of cross-ties. Prior to the creation of the United States Railroad Administration it was impossible to reach any universal agreement upon standard specifications among the producers or the railroads. It is a source of satisfaction to us that standard cross-tie specifications are now an accomplished fact, and we desire to express our unqualified endorsement of the principle of a standard specification.

The purchase of all cross-ties by the line upon which they are produced, and restrictions as to the sale of these ties to the producing road only, is a direct limitation of markets. The effect of this ruling created radical changes in the very fundamentals of operation that had been in effect by numbers of the organizations for a considerable period in the past, and some small measure of these radical changes can be determined by the realization that if the railroads prior to the war had attempted to decide, by common agreement, with power invested exclusively in themselves, that they would nationally agree on the prices and methods of purchase, there would have been grounds for legal recovery of damages to such concerns as the tie producers.

The producer is told he must absolutely deal with a certain railroad or certain officers; that he must deal with them under their own prices and terms; that the conditions are arbitrarily imposed and subject to change without his partaking in any way in establishing the prices or conditions affecting, very fundamentally, not only his possible profit and volume of business, but also the value of his standing timber, which he has carried on his books as an asset based upon his knowledge of timber values as they have existed in the past.

The limitation of the markets for cross-ties has not only been applied to the disposition of ties for use by the United States Railroad Administration, but producers have also been instructed to refer all inquiries from trolley lines and industries for cross-ties to the United States Railroad Administration for fulfillment. One of the most serious questions that must be answered by co-operation between the tie producers and the railroads is the disposition of cross-ties which do not conform to the present specifications.

The establishing of a proper price, neither too high nor too low, on all of the various kinds and grades of ties, in the numerous and extensive tie-producing territories, is a matter that cannot be brought about by any arbitrary power, no matter in what man or group or men that power might be invested. The real basis for the proper price to be paid for a commodity is the law of supply and demand. The proper price to pay for cross-ties, or any other commodity, must be justified in the final analysis by reconciliation with this cardinal rule of business prudence.

The purchaser of cross-ties must necessarily have for his main objective the obtaining of certain kinds and grades of cross-ties delivered at the lowest possible cost at the point of consumption.

There is a well defined and clearly established basis of comparison of values of certain grades and kinds of cross-ties produced in the various regions. For example, a sap pine tie produced in Louisiana is known to be of the same value to the railroads as a sap pine tie produced in Mississippi. Under the present schedule of prices and freight rates, the purchaser of cross-ties must pay $1 for a No. 3 Louisiana sap pine tie delivered at Chicago, while the same tie when shipped from Mississippi will cost him only 79 cents. This difference of 21 cents per tie cannot be accounted for in service to the railroad, and neither can the producer from either territory justify any reason why the purchaser should be required to make any difference in price as long as there is no difference in value.

Cross-ties are not produced in a day, but it takes an average of six months from the stump to the right of way, and often longer. Should producers quit making ties and devote their efforts to hauling their ties, wherever this is possible, so as to deliver them before June 30? Under the former system of purchase of ties, the producer had a contract assuring him of a market for his ties, in most instances before they were produced.

SPECIFIC SUGGESTIONS

(A) The producing roads should continue to purchase, at the present prices, such ties as are offered up to November 1, 1919.

(B) Any railroad may immediately enter into contracts with individual tie producers at prices not to exceed those prices now in effect at point of shipment for deliveries up to November 1, 1919, providing that the quantities and kinds of ties contracted for are approved by the United States Railroad Administration.

(C) All cross-ties should be inspected by the regional inspectors at point of shipment.

(D) The purchase of cross-ties for deliveries after November 1, 1919, should be made in accordance with the following plan:

(1) All railroads should register their annual cross-tie requirements with a central advisory purchasing committee, and all railroad ties should be purchased in accordance with nationally standard specifications.

(2) All railroad ties should be inspected by regional inspectors, in accordance with standard rules for the application of the specifications.

(3) The individual roads should enter into contracts for their cross-tie requirements directly with responsible tie producers, filing copies of any contracts made with the proper department of the United States Railroad Administration.

(4) All contracts should be awarded only after fair and open competition has developed the lowest price per tie obtainable from responsible tie producers. Reasonable assurance of the producer's ability to meet his obligations in the time required should determine the quantity of the ties to be covered in any contract.

(5) In the event of a producer being delinquent in the specified deliveries of certain kinds of ties, the United States Railroad Administration may prohibit his acceptance of any additional business for the same kind of ties.

(6) The purchase of all cross-ties by the individual roads should be effected through nationally standard forms of contracts approved by the United States Railroad Administration.

THE RAILROAD ADMINISTRATION'S REPLY

The reply of the Railroad Administration to this brief was made by H. B. Spencer, director of the Division of Purchases, under date of May 29, of which the following is an abstract:

Before answering your various suggestions in detail, it seems desirable to review briefly the situation which led to the conditions which you now seek to improve. The federal authorties took control of the railroads on January 1, 1918. The organization of the Division of Finance and Purchases was completed about ten weeks later. We were immediately confronted with the following situation: Fof at least two years the production of railroad cross ties in the country had not kept pace with the requirements of the railroads. The business of supplying the railroads with cross ties was almost entirely in the hands of contractors, who, in spite of their best efforts and for reasons which they could only partially control, such as a depleted labor supply and congested transportation conditions, had been unable to supply the needs of the railroads in full. This had brought about a most demoralizing and destructive condition. The railroad companies had repeatedly revised and increased the prices paid under existing contracts, in order to obtain deliveries, and the more aggressive railroads were profiting in that respect at the expense of the weaker lines. Shipments were being held back by producers in the expectation of higher prices and instances were discovered where the same lot of ties had been repeatedly sold to several different roads, each time at a higher figure or under laxer inspection. A survey of the whole situation showed hundreds of unfilled contracts aggregating millions of cross ties, which had been sold by the contractors to individual railroads for delivery during 1915, 1916 and 1917, and which had not been delivered. The production was diminishing instead of increasing and it was vitally necessary that instant action should be taken to correct and improve these conditions.

With the introduction of federal control and operation of the railroads, competition between the individual lines for their supply of cross ties instantly and automatically ceased and the administration's problem was reduced to stimulating and increasing the production of ties as rapidly as possible, establishing a common standard, and distributing the available supply among the individual railroads in proportion to their relative necessities. The steps taken by the administration to solve this problem have resulted in the situation which led to our recent conference.

Proceeding now to answer the specific suggestions presented by your committee: The attitude of the Railroad Administration is not one of antagonism to the large tie producers. On the contrary, it is recognized that their established organizations, their knowledge and experience in the business can be of the utmost assistance to the administration in bringing about the results which are necessary to the proper maintenance of the rairoads, and it has been and is of the desire of the administration to utilize all of the facilities and the best efforts of the large tie producers to the fullest extent compatible with the best interests of the railroads themselves in securing their supply of cross ties.

In the matter of standard specifications, we were in substantial accord.

With regard to the limitation of markets, we could not agree to the proposition that the individual roads should be released from the regulation of obtaining through the agency of the central administration and the traversing roads such cross ties as they may have to draw from territory beyond that which they themselves traverse, and that they be permitted to deal and contract with any and all tie producers independently of that regulation. The necessity for central control of the distribution of available ties between federally-controlled roads according to their relative needs, as referred to above, is the vital reason for refusing to permit direct contracts between the individual railroads and individual contractors, except on the producing roads.

The so-called fixed prices are maximum ones only and even in that respect they are not absolute and beyond reconsideration. Prices in any given territory have been arrived at after careful consideration and by negotiation between the buying roads and the producers. They may be made the subject of negotiation again if that should become necessary.

The prices originally published obviously were not determined upon to strangle production, but on the contrary were made on a level high enough to induce tie producers of all classes to increase production. It was our belief that production was low rather for want of labor than on account of unremunerative prices. Now when labor recently has become more plentiful, cross tie production has increased remarkably and ties are coming to the roads at present in larger quantities than at any time in the past.

At the moment no objection could be seen to complying with your request that such ties should be bought at an f. o. b. price based upon certain commercial delivery centers to which through freight rates are in existence, but such an arrangement would require a detailed study of each situation. The railroad administration is prepared to consider each locality in detail whenever presented.

Upon the uncertainty as to future prices, it was stated that a duration of time for purchasing ties could not well be given or maintained for purchases made under publicly posted prices. In many cases, however, contracts have been made for a specific number of ties, the delivery of which extends under the contract for a definite period, in some cases to June 30 next, in other cases until the end of the calendar year.

We are not undertaking to dictate to steam roads not under federal control and trolley lines how they should buy their ties, nor to control them in their methods, nor to combine with them. We have consulted with them only where our interests are common and are endeavoring only to increase the output of suitable and satisfactory ties for our respective needs, taking into consideration the interests of all classes of tie producers.

At the end of our interview, we defined our position with respect to the specific suggestions made to you, by summing up as follows:

1. That the administration will not agree to discontinue the purchase of ties direct from the small producer.
2. The price to be paid for cross ties, whether to the small producer or to the larger producer, is a matter of negotiation between such producers and purchasing agents of the roads traversing the producing territory, and that this negotiation is done under the supervision of the regional purchasing committees and in conjunction with them.
3. The administration will adhere to the policy of publishing the prices the roads will pay for cross ties, such prices to have been arrived at by negotiation as above.
4. The director of purchasers will make contracts in the name of the administration with large tie producers for given quantities of cross ties for allotment to the different roads, if satisfactory terms for delivery, prices, quality, etc., can be arrived at.

TIE PRODUCERS' REBUTTAL

In behalf of the National Association of Railroad Tie Producers, J. W. Fristoe, president of that organization, replied to Mr. Spencer as follows on June 11:

There are certain fundamental principles connected with the purchasing of cross ties that involve the question of how far the concentration of the purchasing power of the government may be developed into one single agency before it becomes an oppressive factor in the conduct of purchases for the railroads. The intent and purpose of well-known federal statutes, such as the Sherman Anti-Trust law, and the Clayton law, covering the method of purchasing to be employed by common carriers, has taught us to look upon the limitations of our markets, and the fixing of cross tie prices by the railroads, as the exercising of a power temporarily justified as an emergency war measure, but an authority which would be immediately abolished together with the dissipation of similar restrictions originally placed upon other commodities purchased by the railroads.

We, of course, cannot question your authority to limit our markets and fix cross tie prices, but we feel justified in questioning the propriety and fairness of any such restrictions. Our attitude in this matter appears to be in substantial accord with the recent statements of the director general in speaking broadly of the purchasing policy of the United States Railroad Administration, which we take the liberty of quoting herewith: "It (the United States Railroad Administration) is trying to handle this purchasing matter in a reasonable, businesslike way largely through the methods which were employed under private management and with an effort to prevent any concentration of the purchasing power by the Government into one single agency in such a way as to be a disturbing or an oppressive factor in the conduct of purchases for the railroads."

The plan we suggested for your consideration surely complied with all of the principles that might be inferred from the statement of the director general, with the added advantage to the administration that the supervision of a centralized purchasing agency was conceded in the hope that this supervision would not become oppressive.

In reference to the definition of your position as summarized in your letter, we wish to make the following statements: We did not suggest, nor do we subscribe to, any plan making a distinction between the large and small producer. There is a specific provision in item 4 of the plan we suggested wherein the railroads could purchase in as small quantities as may be desired. The advisability of purchasing from tie producers of various capacities would prove itself in each instance, and the advantages should be so clearly self-evident as to carry their own weight when measured by common business prudence.

We wish to correct at this time any inference that the price to be paid for cross ties is or has been a matter of negotiation, if by negotiation is meant a mutual agreement based upon the usual rights of buyer and seller. The objection to the prices published by the Administration arises from the fact that the administration is by far the largest purchaser of cross ties in the United States, and when it establishes maximum prices that will be paid for cross ties, it places our industry in the undesirable and unusual position of having the price of a commodity established by the largest consumer.

CANTING RAILS AND GAGE

By Charles J. Lepperd
Supervisor, Philadelphia & Reading, Coatesville, Pa.

SOME RAILROADS have experimented with the canting of rails inward in contrast with the general practice of maintaining the vertical axis of the rail perpendicular to the plane of the track. This article is not intended as an argument either for or against this practice, but merely contains some observations which have been made where rails have been canted outward through improper maintenance. In many cases trackmen blame gage troubles upon surface and equipment while overlooking the real cause which is the canting of the rail.

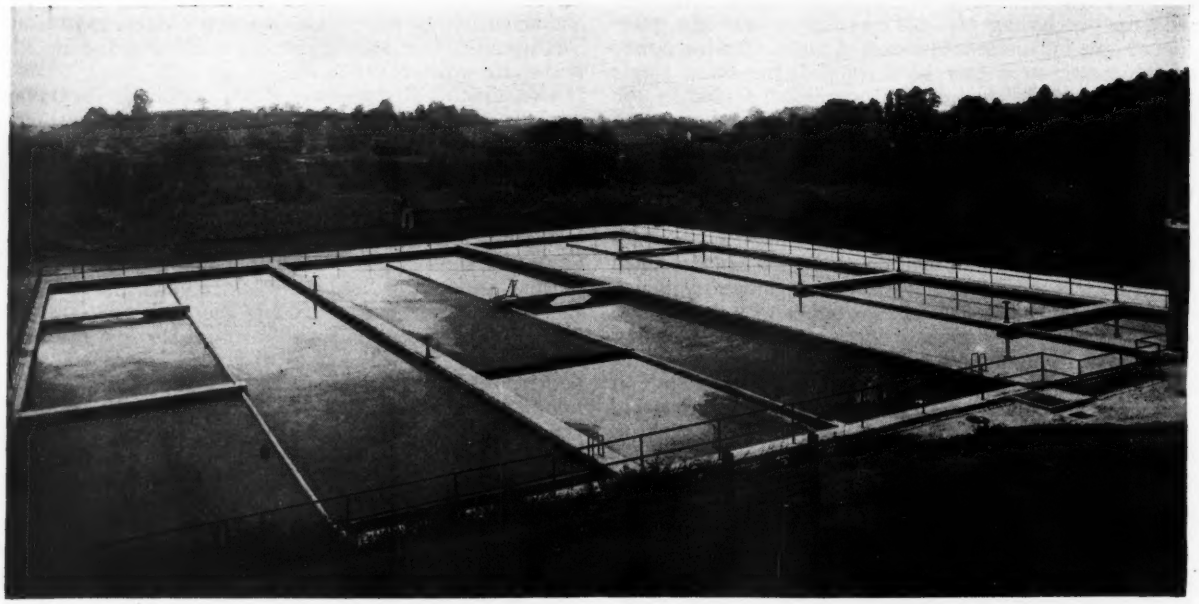
The maximum super-elevation permitted on many roads is eight inches and there is a tendency among some maintenance of way men to use the maximum wherever the usual rule will admit. It is our experience that a maximum of six inches produces better results on a branch line where the highest speed is 45 miles per hour. When this rule is followed on curves of 6 deg. to 12 deg. there is a considerable decrease in the amount of maintenance required to keep the track in good line and surface, and very little gage trouble due to canted rails. A coal train has been known to turn out the low rail on a 9-deg. curve, which proves that the horizontal component of the resultant reaction of a moving train transmitted to the rails is one that must be reckoned with by track men. Every track man knows how the low rail of a track used by low speed freight trains will cant outward, especially if there is too much super-elevation for low speed trains. This makes it imperative that those in charge of the supervision of the track make periodic inspections of curves where it is known that the low rail is prone to cant, and see that conditions are remedied as soon as necessary or before they lead to further trouble, such as overturned rail or wide gage.

This condition results not only on curves, but on approaches to curves not eased by transition curves where necessarily there is super-elevation in tangent track. Our observation has been that wide gage due to canted rails is more serious on such approaches to curves than upon the curves themselves. This is due to the fact that on the curve the centrifugal force relieves the low rail of some weight which on the tangent approach is transmitted directly to the rail and, due to the super-elevation as well as to the coning of wheels is inclined at the same angle instead of being vertical.

The canting of rails is not confined to branch lines, but they have been found on a high speed passenger line where traffic is dense during the summer season and the heaviest engines are used. Fast engines swayed from side to side on long tangents and some of the track men blamed the engines for widening the gage of the track. The real cause was the canting of the rail. Engines which were inclined to sway, as well as those not so inclined, soon spread the track, not sufficient to make it unsafe, but the result was cumulative and in a geometrical ratio. After the bearing surfaces of the ties were adzed to the plane of the track the maintenance work was greatly reduced.

When laying new rail it is important to adz the ties to a proper bearing. This will reduce the amount of rail laid in a given time, but where traffic will permit it is the most economical method. Where this condition is found and new rail is not to be laid soon a small track gang may adz the ties by removing several rails at one time, unfastening the joints only where the track is cut. Usually it is necessary to adz all ties unless the work is done while renewing them. We do not renew ties out of face and even if as high as one-fourth of the ties in a given section of track are renewed at the same time, the rail soon will have cut into the new ties and assumed its old canted position.

This condition probably will exist as long as the coning of wheels, which is an almost universal practice. Frequently it is neglected because section foremen fail to understand the reasons for it, but if brought to their attention by their roadmaster and a demonstration is made they will readily understand and appreciate the importance of keeping rails perpendicular to the track.



The Settling Basin

WATER FACILITIES FOR SOUTHERN AT MONROE

Decreased Operating Expenses and Improved Service Reflect the Importance of This Installation

THE ECONOMY and regularity of movement of freight and passenger trains over the north end of the Washington-Atlanta double track line of the Southern railroad has been greatly improved by the installation of a modern water station which has recently been completed and placed in service at Monroe, Va., the locomotive terminal for the Washington and Danville divisions. All trains on the Washington-Atlanta line change engines at Monroe and the effect of this improvement in the water supply was at once reflected in the smoother operation of trains and improved regularity of service.

The water from Harris creek, which is used here for engine supply, was turbid and exceptionally muddy. It caused trains to lose time due to "foaming boilers" and clogging up the injectors, with resulting high maintenance costs for boilers and flues, owing to "scale formations." By means of a sedimentation basin and coagulating system, however, this water has been converted, the treated product being satisfactory for the locomotives as well as for drinking and other railroad purposes.

The water supply plant, which is the only one of its kind on the Southern, consists of a pumping station, a sedimentation basin of 2,500,000 gal. capacity, an oil storage house, a chemical house, together with two steel storage tanks, each of 100,000 gal. capacity, and sand filters for furnishing drinking water to the shops, passenger station and other buildings.

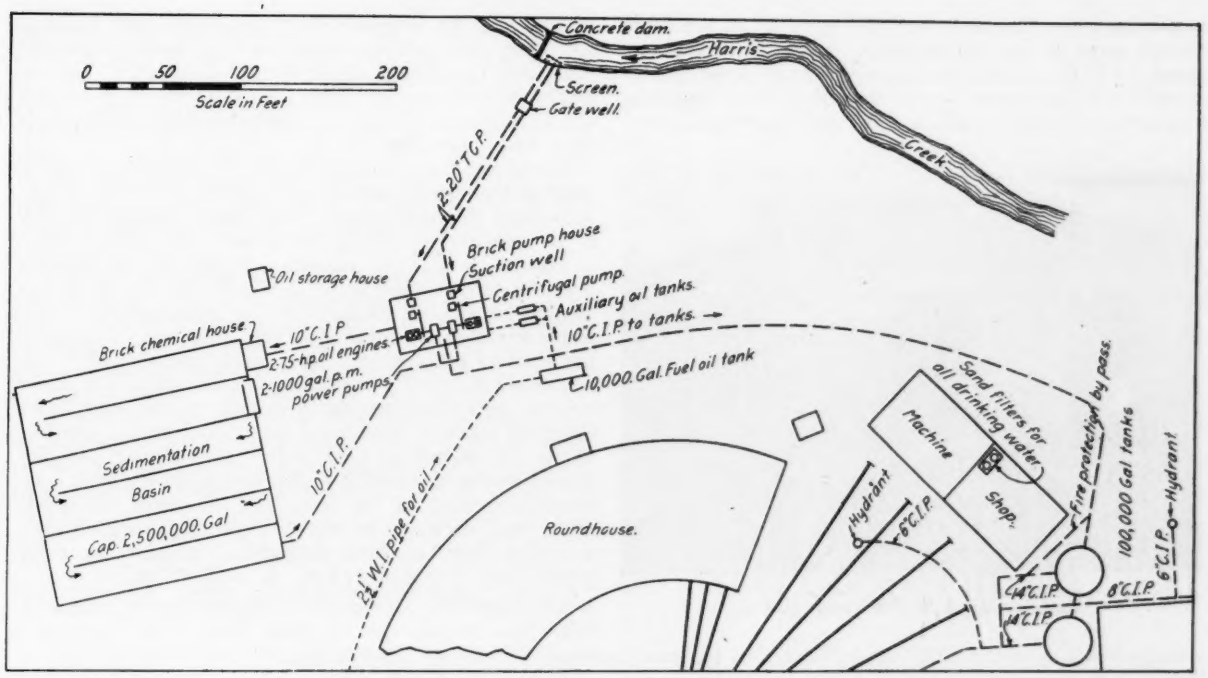
The pumping plant is based on a double duplicate installation. Each unit consists of one centrifugal pump, delivering 1,000 gal. per min. and one piston pattern power pump delivering 1,000 gal. per min., both operated by one 75 hp. low grade oil engine and air starting apparatus. This machinery is so arranged and installed by a series of friction clutches that either engine may operate either pump, thus giving a very flexible operation. The oil engine is of the two-cycle vertical type and may be operated on low-grade fuel oil without the use or necessity of spark, battery or magneto. All of this machinery is installed in a brick house 37 ft. by 61 ft. in area, with a concrete floor.

The low-grade fuel oil used in operating the engine is stored in a 10,000-gal. steel tank installed underground, which allows the purchase of oil in tank car quantities. This fuel oil is so located that it flows by gravity to the engines and is raised automatically by a pump on the engine to the combustion chamber. That the pump house may be kept perfectly clear and clean, a separate oil storage house was constructed in which to store waste, kerosene cans, lubricating oil barrels and other materials.

The sedimentation basin is 183 ft. long, 140 ft. wide and 12 ft. deep, and is constructed of reinforced concrete. It is divided into three separate compartments, as may be seen on the map of the layout, in order that each compartment may be cleaned without interfering with the operation of the plant. Hydrants and 2½-in. hose are installed about the basin for this purpose. The mud is thus washed out and emptied into Harris creek below the dam through sluice gates installed in each compartment of the basin.

The chemical house is 20 ft. by 26 ft. in area and is of brick construction with concrete floors and basement for storing alum, general repair parts, etc. The chemical equipment consists of two alum bins, two mixing basins, automatically operated alum conveyors and a feeding device which can easily be regulated according to the turbidity of the water, to give the required amount of alum per gallon of water. An electric alarm is attached to the alum feeding device which sounds in the pump house and notifies the pumper if the alum is not being delivered in proper quantities in the mixing chamber.

Installed in the present machine shop are two 25-gal.



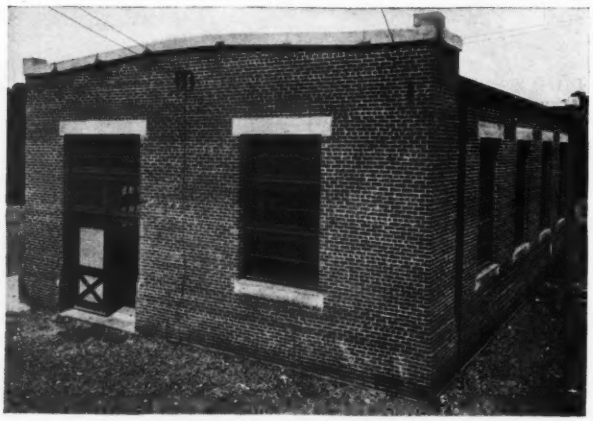
Map Showing the Complete Water Service Installation

per min. sand filters to furnish drinking water to the shops, passenger station and other railroad buildings. The water which passes through these filters comes from the storage tanks after having been settled and coagulated, and has been specially analyzed and found to be entirely satisfactory for drinking purposes.

A concrete dam with two sluice gates is installed at the creek. The water flows to a gate well and is gravitated through two 20-in. terra cotta pipes to the two separate concrete suction wells installed inside the pump house. The centrifugal pump delivers the muddy raw water to the first half of the first compartment in the sedimentation basin, from which it flows to the second half of the compartment. It is there mixed with from one to two grains of alum per gallon of water at the mixing chamber. From here the water gradually flows

Interior of the Pump House, Showing the Equipment

around and over baffle walls to the last half of the third compartment in the sedimentation basin, a distance of about 1,140 ft. From this basin the clear water gravitates back to the power pumps through a 10-in. cast iron pipe and is then delivered to the two 100,000-gal. steel



Exterior View of the Pump House

storage tanks erected on high steel frames. A by-pass is installed at the storage tanks and enables the power pumps to pump directly into the fire mains.

The requirements at this station are about 600,000 gal. per day, and the cost of pumping water, including the salaries of the day and the night pumpers, alum, fuel oil, lubricating oil, waste, etc., is $0.035 per 1,000 gal. This does not include repairs or interest on the investment.

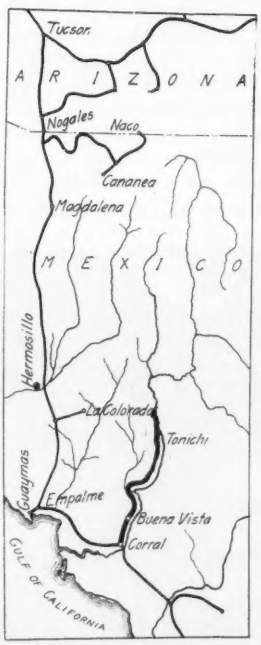
INSPECTING A MEXICAN RAILWAY IN A BANDIT-INFESTED AREA

CONDUCTING AN inspection of a line of railway under the protection of an escort of 300 troops might not have appeared unusual on the western European battle front or in Russia during recent months, but such a procedure is unique in present day railway history in North America. However, such were the precautions which it was necessary to take in making an inspection of the condition of the Tonichi branch of the Southern Pacific Railroad of Mexico in the state of Sonora. The inspection was under the direction of J. D. Mathews, engineer maintenance of way, and W. E. Schley, division engineer of the Sonora division of this road during June of this year. This branch extends from Corral, 93 kilometers (57.6 miles) south of Guaymas, northeast along the Yaqui River, 55 kilometers (34.1 miles) to Tonichi. It was built between 1906 and 1909 and operation was discontinued in 1913 because of revolutionary disturbances. The inspection made in June was to determine the present condition of the line, the nature of the repairs necessary to restore it to operation and the cost of this work.

The area traversed by this line has been over-run during the last few years by roving bands of Yaqui Indians, who have committed many depredations. The present condition of Buena Vista, one of the towns midway on this branch, is typical of the devastation which has been wrought in this part of the country. Until a few years ago this was a thriving village surrounded by a considerable area of cultivated land which produced all of the food required by the inhabitants and a considerable surplus for exportation to adjacent mining camps and nearby cities. The inhabitants were Mexicans, peaceful and industrious. Today, Buena Vista is a wreck, the skeletons of its buildings still standing but with their adobe walls shorn of their protecting roofs and crumbling before the wind and rain. In the ruined residences are wrecks of stoves, cooking utensils and furniture, all destroyed and burned while the people have long since fled.

It was the danger from these roving bands of Yaqui Indians that made necessary the provision of the escort in making this inspection. This escort consisted of 300 native soldiers, including 50 cavalry and 250 infantry, in charge of Mexican officers. In proceeding over the line the escort was formed with 25 of the cavalry in advance, marching about 15 min. or about one half kilometer ahead of the infantry. The latter was followed by the railway officers with their pack animals, while the remaining 25 cavalry brought up in the rear. The entire column extended considerably over a kilometer along the road when in motion. On arriving at the camping places at mid-day or at night, the advance cavalry posted themselves on the higher points on the hills commanding a view of the camp and the surrounding territory and remained in that position until recalled after a sentry line had been established around the camp proper.

The condition of this line is instructive as indicating what may be expected on many other lines which have been laid waste during the revolutionary troubles in Mexico. The major portion of this branch was laid with Japanese oak ties during construction, although some Oregon pine ties were also installed at the time the line was built and in early renewals thereafter. The inspection showed that the Japanese oak ties had completely rotted, although a considerable proportion of the pine ties are still in condition for further service.



The Area Traversed

Because of the advanced state of decay of the oak ties, the grass and incendiary fires, which have been numerous, have completely consumed these ties, leaving the rails lying on the ground, usually undamaged, although they have been kinked where brush or other fuel has added to the flames. The Oregon pine ties have not burned as readily and it was not uncommon to find considerable stretches of track which had been burned over with the rails still resting on the pine ties, while the oak ties between them had been completely consumed, the difference in action being probably due to more advanced state of decay of the oak ties.

An interesting exception to this tendency of the Japanese oak ties to decay was found within the tunnels where the ties appeared as if they had just been laid, many of them still presenting the appearance of newness. These tunnels are dry and this is probably brought about by the absence of the alternate wetting and drying. In some instances it was found that considerable numbers of spikes had been removed from the tracks for conversion into horse shoes. This practice was not, however, common.

Bridge timbers were generally found to be in better

condition, few of the decks of the unburned trestles being in such a state of decay that they could not be operated over at once and all of them with minor repairs. The piling, however, was found to require considerable reinforcing, both because of the inroads of decay and because many of the piles had not been driven deeply, in the original construction and had since been uncovered, the scouring of the arroyos having left piling hanging suspended from the caps by the drift bolts.

The only buildings left standing on the line were an ore platform, two water tanks and two depots. Relatively little of the telegraph lines has been destroyed; although the larger part of the poles still standing are worm-eaten and rotten at the ground line and have been greatly weakened.

In general the tunnels are in good condition, the principal repairs necessary being the removal of small slides from the portals. About 50 per cent of the roadway signs will require renewal. The heavy growth of brush on the roadway and about bridges and telegraph poles constitutes a serious problem for it must be removed promptly if danger of further fires is to be avoided.

The trip was not without its exciting experiences. On the return which was made across country from Tonichi to LaColorado by automobile and again under military escort, it was necessary to stop to repair a tire blow out at the point in a canyon where an American and his Mexican helper had been ambushed and killed while driving a motor truck over this same route within a month, while a well-to-do Mexican and two companions were ambushed and killed a few days previous in traveling by the same automobile in which the inspection party was traveling, the steering column of the machine still carrying marks of that encounter in the form of a segment cut out of the semi circle by a brigand's bullet. In another instance, the party came upon the camping place of a party of Indians which had been abandoned only a short time before.

What Causes Decay of Structural Timber?

By E. E. King,
Professor of Railway Civil Engineering, University of Illinois, Urbana, Ill.

THE OLD ARGUMENTS concerning the decay of wood—that it was the effect of changing from wet to dry, was the result of fermentation of sap, or was due to chemical changes that took place when the wood was brought in contact with the soil—were silenced some time ago when it was proved that decay was solely the result of the action of fungi. Fungi are nothing more nor less than a low form of plant life that finds its way

Tell-tale Fruiting Bodies on Fungi Infected Timber

into the interior of the wood. They have a thread-like form that penetrates the wood from cell to cell, dissolving out those portions that lend to mechanical strength. They issue certain complex secretions that dissolve the cellulose and other materials that form the walls of the cells of the wood and in this state these substances become food for further fungus propagation. After this action of the fungi has continued until many of the tissues are dissolved, the portion that is left has lost its coherence and is in a state of what is termed decay.

In order to live fungi must have their food, which, unfortunately, is the most vital portion of the structure of the wood. But they must have other things for their subsistence; they need to have moisture and air. Everyone in railway practice has noticed how piles fail at the water line and how poles and posts rot just beneath the ground line. The portion of the piling that is completely submerged will never fail by decay because the water excludes the air, which is a requirement for fungus growth. A post rots just below the ground line because there it has plenty of moisture and air. Beyond a depth of two feet there is not much air if the post is properly set and the decay is proportionately slow. Above the ground line sufficient moisture for rapid decay in the post does not extend for more than a foot. In the case of piling, however, sufficient moisture is carried by capillary attraction or other means for a short distance above the water line to cause rapid decay, for which the conditions are frequently ideal. The sapwood is the first to go because it contains more fungi food, the sugars and the starch.

Another factor to be considered in connection with fungus growth is the temperature of the air. There are all kinds of fungi, but the ones most destructive to tim-

Rot Occurs Most Readily at the Water Line or Just Above

ber are most active when the air is warm. No doubt many of them are more or less active when the weather is cold, but most decay occurs during the warmer months

of the year, if the moisture conditions are satisfactory for rapid fungus growth.

The fungi not only may propagate themselves throughout a piece of wood until it is entirely decayed, but they may also spread from one piece to another if they come in contact in any way. The threadlike growths may even

Timber Trestles are Replaced Part by Part as Decay Progresses

find their way through the ground to infect another piece of wood near by. Thus a piece of rotten timber may infect not only that which it touches, but that which lies in its immediate vicinity; and if conditions for the action of the fungi are favorable, the decay will spread very quickly.

The second stage in the growth of the fungi is the bracket or toadstool which forms on the face of the decomes a powdery substance called spores. These spores, like dust, are carried by the wind and fall on everything. Only a comparatively small percentage find lodgment where they can grow, but these will in time produce other fungi and thus repeat the cycle.

In these days when so much consideration is being given to economy in the means and methods of railway construction and operation more attention should be given to the question of the conservation of our timber supply, especially to protect it against the agencies of decay. Some preventive measures may be employed to check the ravages of decay, one of which is to choose the proper method of piling timber as soon as it is cut or sawed. The ground on which the timber is piled for drying should be as free of moisture as any that can be found. It should likewise be free from decaying timber as well as brush and weeds, for the decaying timber produces millions of fungi and their spores. If the sun and wind can have free access they will hasten the process of seasoning and reduce the chances for infection by these destructive agencies.

The time of cutting the wood is a factor that will influence the rate of decay. Wood cut in the winter time fares better than that in the summer, not because the sap is "down," for experiments have shown that it is has as much sap then as it has at other times, but because the temperature and other conditions are less favorable for decay. It dries a little less rapidly at this season, too, and prevents the excessive checking that accompanies summer drying.

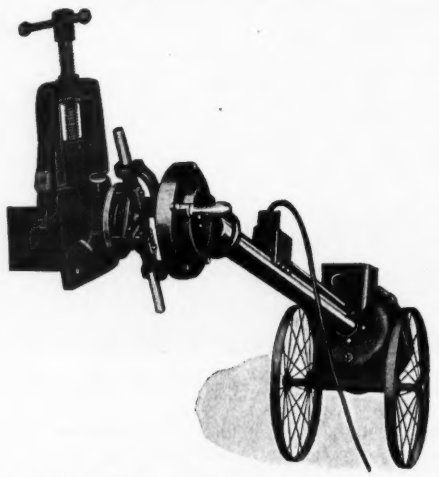
The most positive preventive against decay is to treat the wood with some agency that possesses sufficient toxic properties not only to destroy the fungi that are already in the wood, but also to poison the food for those that might come later. This idea has prevailed to such an extent that it has become responsible for the construction of the numerous treating plants that have been established throughout the land and has made timber treatment an industry in itself.

POWER DRIVE FOR PIPE TOOLS

A NEW electrically-driven device is now being manufactured to operate hand pipe threading and cutting tools which has the effect of making power-operated equipment out of the hand tools while retaining the advantages of portability inherent to the hand equipment. The device consists of an electric motor in a suitable case and mounted on a pair of wheels. A long shaft enclosed in a suitable housing extends like an arm from one end of the motor box. The outer end of this shaft is connected by a set of bevel gears to a pair of arms that engage the handles of the hand cutting or threading tool as mounted on the pipe. This arrangement with beveled gearing makes the equipment independent of the height of the workbench and eliminates the need of any universal joints or other possible complications.

The machine is supplied with 20 ft. of flexible electric cable for attachment to a current outlet, the cable being plugged into a switch box mounted on the shaft housing conveniently near to the cutting tool. The motor is started and stopped by a push button switch located on the switch box while a two-speed transmission gearing, to change from one speed to another, is controlled by moving a knob projecting from the motor box either in or out.

Some idea of the possibilities of this machine may be gained from the statement of the manufacturers that



View of the Power Drive as Placed in Position to Operate a Thread Cutter

the cutting of a thread on a 12-in. pipe which ordinarily would require one hour if done by hand, may be done by the same tool operated by the power drive in not to exceed seven minutes. This equipment is manufactured by the Toledo Pipe Threading Machine Company, Toledo, Ohio, and while designed for use with the threading and cutting tools manufactured by that company, may be used equally satisfactorily on tools of other makes of similar designs.

THE CORRECT MAINTENANCE OF TERMINAL TRACKS

A Discussion of the Conditions Under Which Work is Done and Methods Imposed by Surroundings

BY J. B. BAKER,
Supervisor on General Manager's Staff, Pennsyvlania Railroad, Philadelphia, Pa.

TERMINAL maintenance from the viewpoint of the roadmaster or supervisor may be divided into various phases. For convenience it will be treated under the following headings:

1—Passenger Facilities.
  a—Running tracks.
  b—Station tracks.
  c—Coach yard.
  d—Pullman and dining car yard.
2—Freight Facilities.
  a—Running tracks.
  b—Receiving, classification and advance yard tracks.
  c—L. C. L. transfer tracks.
  d—Car repair tracks.
  e—Ladder tracks.
3—Common to Passenger and Freight.
  a—Inspection pits.
  b—Engine house adjuncts.
  c—Shop yard.
  d—Coaling and ash tracks.
  e—Engine storage yard.

The trackmen will be most interested in the maintenance and renewal of rail switches (including slips), frogs and guard rails, cross and switch ties, ballast, drainage and policing.

In most terminals passenger movements and tracks are quite separate and track gangs are organized accordingly. The details of track maintenance are quite different, as are also the conditions under which the work is done. In terminals which have been electrified the divergence is even more marked. In passenger territory the movement is usually at higher speed and greater frequency; there is little or no opportunity to raise track and the quality of maintenance must be higher than when used for freight movement. Therefore, methods and practices of maintenance and renewals will be considered separately for the three general headings named above.

PASSENGER FACILITIES

a—RUNNING TRACKS—These tracks are usually maintained at the standard set for main passenger service and, with the frequency of trains and the necessity for keeping all tracks clear of obstructions, the cost is relatively high. Rail renewals are frequently made at night when the traffic is the least dense, and other renewals can be carried out at the most favorable intervals.

It is usually possible when renewing switch points to pick an interval during comparatively quiet periods and concentrate at such times on work of this kind. This applies to surfacing and ordinary repair work given switches, frogs and guard rails. In renewing cross and switch ties it is usually necessary to remove all ballast to the bottom of the ties and raise the rails a sufficient height to clear the ties and rails of adjacent tracks. The cost of renewal is much in excess of the cost under road conditions and the idle time of men becomes an increasingly important factor. The cleaning of ballast and disposing of the refuse by fork and hand methods is costly and laborious at best, and should generally be done at the time ties are renewed. Ballast is not required in as large quantities for annual renewals in the case of passenger tracks as for freight tracks. Comparatively small size stone ballast, about 1 in. to 1½ in., can be used to advantage and is easier to handle.

Drainage is of paramount importance in the maintenance of any track, and is possibly more difficult to obtain in yards than for main running tracks.

Policing of passenger facilities does not entail as heavy work as in the case of freight tracks, but it should be done systematically and daily. Where possible the debris should be disposed of locally each day. In the case of paper which has decided value this can generally be done and a study of the possibilities will frequently indicate a means, such as by carts or trucks, of handling ashes and track cleanings. Cars, perhaps of special design, conveniently placed, are sometimes used. The most important consideration is that the cleaning or policing shall be done currently, undue accumulation being prohibited.

b—STATION TRACKS—These may be defined as those within limits of station platforms at terminals where practically all trains come to a stop. There are usually few switches, and the chief difficulty of maintenance forces is in finding a period in which to work when the tracks are not occupied. Renewals of rail and cross ties must in many instances be made at night. Drainage of uncovered tracks is important and the difficulty increased by the use of sand in starting trains and the sweepings from platforms.

c—COACH YARD—In these the maintenance is not usually of a high degree, as the movement is at slow speeds. Rail renewals are infrequent. Switches generally are of the hand-throw type and are apt to be run through and damaged. Difficulties pertaining to the maintenance of frogs and guard rails will be minimized by their close inspection and daily maintenance.

The ballast is usually cinder or gravel, requires little cleaning or renewing, and is easy to work. Drainage is apt to be inadequate, but can be helped considerably by an intelligent effort at surface grading.

Policing in the coach yard is important, and special ar-

rangements should be made to dispose of the collections, requiring a minimum use of tracks. Receptacles are too often placed at inaccessible points. They should be located within reach of teams or tracks not blocked so they may be readily emptied.

d—PULLMAN AND DINING CAR YARDS—The same general observations are applicable as to coach yards except that trucking platforms and sheds are frequently provided and a storehouse is located adjacent to the yard. The platforms make maintenance more difficult, but if properly constructed and taken advantage of can be made great aids to drainage.

Policing should be taken care of currently and gotten away quickly. In the case of dining car refuse an incinerating plant will be of service.

FREIGHT FACILITIES

a—RUNNING TRACKS—These are not generally of the high speed type, but should be kept in fairly good condition. There are no special difficulties entailed, but considerable lost time results from long trains and slow speed. Rail renewals can usually be made at a time when it is possible to divert trains. Switches, frogs, cross and switch ties and ballast should be maintained in fairly good condition, and it will be found much better to institute frequent and regular inspection repair work rather than to concentrate on various features at longer intervals.

Drainage is important in the degree of the wheel loads carried by the subgrade, and is generally more easily accomplished than for other tracks, but is too frequqently neglected. Policing varies with the kind of traffic handled. If such bulk freight as bituminous coal and ore predominates the labor of keeping the tracks clean will be considerable. Handling scrap iron and cleanings may be increased by frequent train service, making it very desirable to dispose of the debris by other than work trains.

b—RECEIVING, CLASSIFICATION AND ADVANCE YARD TRACKS—The tracks in these yards are generally and uniformly difficult to maintain because of their almost constant use, and in the case of mineral yards because of the great quantity of material spilled and shaken from the cars onto the tracks. Rail and splice materials are never of the best, and add considerably to the wear. Ties are apt to be of inferior size and allowed to remain beyond their useful life limit. Maintenance work is generally done in the form of renewals, i. e., when a particular track absolutely requires attention arrangements are made to obtain the use of it and it is then renewed and practically rebuilt. Ballast is usually of cinder or gravel, which is not difficult to handle, but after a few years' service becomes practically impervious and offers very poor opportunities for drainage. Drainage is usually of the surface type and is seldom adequate, resulting in bad pumping track.

Policing of these yard tracks is difficult and apt to be dangerous. It should be done frequently, but such is unusual, with the result that accumulations are large, necessitating the services of a work train and a large number of men. In most yards the practice is to gather or scrape the dirt into piles in places where it can be reached by a work train. The dirt may be piled in an inter-track space, but it is preferable to locate the dirt piles in an open space if possible. The cost per 1,000 lin. ft. of track covering a single cleaning, including the gathering of the dirt into piles and hauling away by work train, will be about $10. This figure will vary somewhat with the class of yard and kind of dirt,. and the annual cost per 1,000 lin. ft. of track of periodic cleaning will be about as follows:

Type of Yard Classification Yard	Frequency of Cleaning	Annual Cost Per 1,000 ft. of track
Merchandise freight	Every six months	$20
Mixed freight	Every four months	35
Mineral freight	Every two months	60

c—LESS CARLOAL TRANSFER FACILITIES, AND (d) CAR REPAIR TRACKS—These are difficult to renew and maintain owing to the fact that they are in almost constant use and seldom are properly drained. The cost is comparable to similar work in receiving and classification yards and will be high on account of lost time and restricted space for material and working room. Drainage is usually poor or lacking and should receive definite consideration.

Policing should be done constantly and no accumulation allowed. The gathering up of car cleanings, wrappings, paper, etc., should be done by transfer forces and in car repair yards the policing of material and refuse from the work should be done under the supervision of and by the car repair forces. Strictly track refuse should be kept cleaned up by the supervisor. The cost of policing in transfer and repair yards will vary considerably with the service and the methods employed as well as with the seasons. The cost of cleaning up accumulated refuse will be about the same as for corresponding areas in classification yards handling mixed freight.

e—LADDER TRACKS, especially the advance end of receiving and the receiving end of classification yards which are almost continuously occupied, are such that the cost of renewals and maintenance will be high proportionately. There is a considerable unproductive labor time. The average cost to renew switches, frogs, guard rails, cross and switch ties in such ladder tracks, including labor only, is approximately as follows:

Switch points	$4.00 per point
Frogs	6.00 per frog
Guard rails, including plates and fastenings	4.50 per guard rail
Switch ties in stone ballast	1.80 per switch tie
Cross ties in stone ballast	0.85 per cross tie

Drainage is generally poor and productive of bad maintenance conditions. Comprehensive plans for drainage should be worked out and applied.

Policing should be done regularly at frequent intervals, as these ladders are prone to accumulation of refuse due to spilled lading. The cost of cleaning will be high on account of lost time, but one or more men working constantly will maintain fairly clean conditions at a less cost than by dependence on periodic cleanings by work train forces. To clean up and remove accumulated refuse by work train will cost about $30 for a ladder of 20 switches.

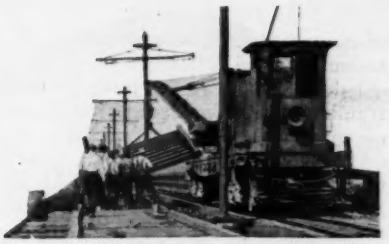
POINTS COMMON TO PASSENGER AND FREIGHT ENGINE TERMINALS

The renewal and maintenance of the track structure should be made by track forces reporting to the supervisor, and must be carried out in conjunction with those charged with the movement on the tracks to the end that the work may be done with a minimum of unproductive time. Drainage is seldom taken care of on broad, comprehensive lines, and the physical conditions should receive thorough study and be dealt with to secure rapid and adequate sub and surface drainage.

Policing should be done by the mechanical forces in charge of the facilities under the joint supervision of the master mechanic and the supervisor. The cost will depend upon the method followed, but if the refuse is allowed to accumulate and is then removed by track forces in conjunction with work train the cost will be about $13 per 1,000 ft. of track. Care should be taken to sort out the coal and this reclamation should be made before loading into cars with refuse.

EFFICIENT METHODS IN BRIDGE DECK RENEWALS

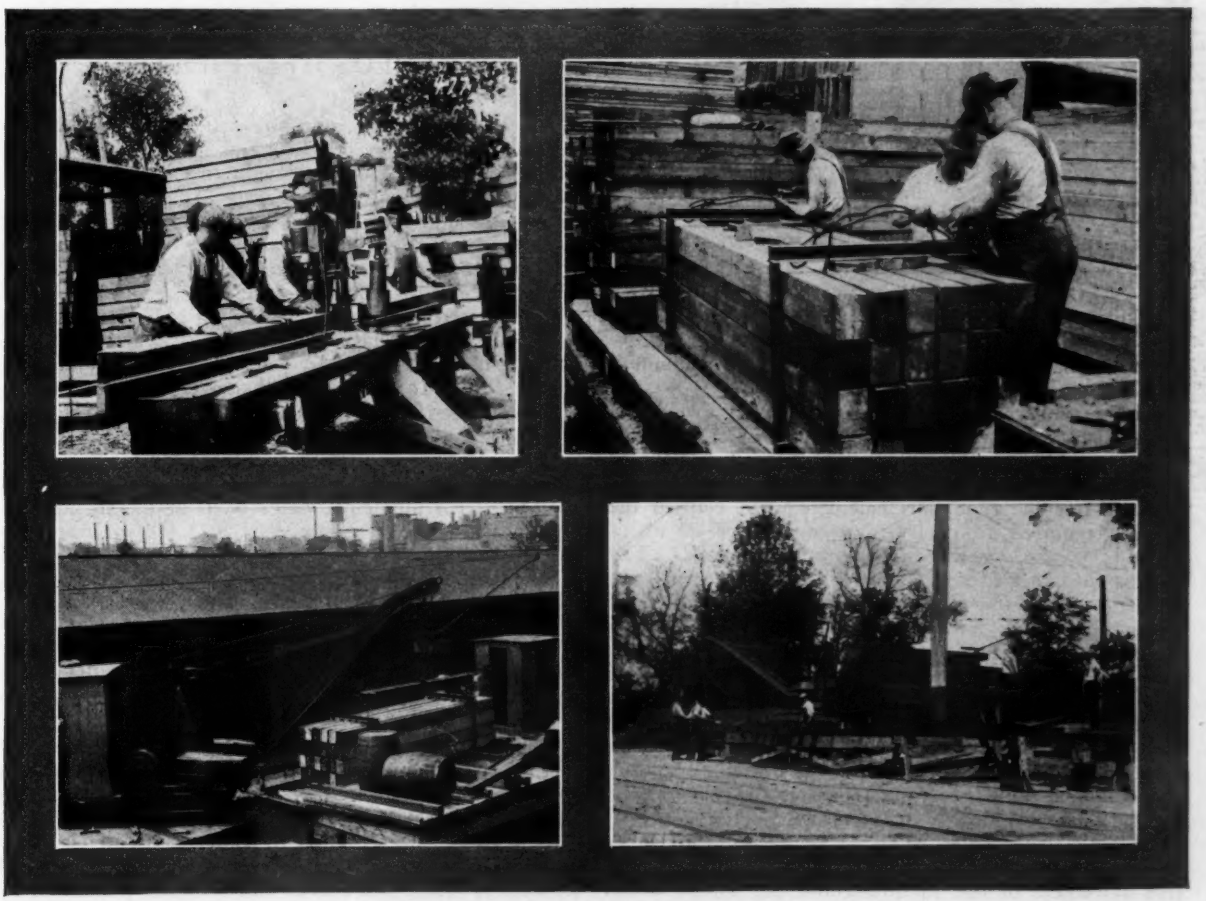
Electric Line Uses Power Tools and Erection Equipment and Unit System of Assembling on High Steel Viaduct



Taking a Unit on to the Bridge

UNUSUAL METHODS were used by the Milwaukee Electric Railway & Light Company in replacing the deck of the Wells street viaduct, Milwaukee, a high structure nearly one-half mile long crossing the Menomonee valley, which carries a double track electric line. The particular feature of this work was the assembling of the decking in units 14 ft. long which were carried out onto the bridge and swung into place by a derrick car. As a result of the methods pursued the work was conducted rapidly—the entire 2,060 ft. of deck for one track being replaced in 10 days with a crew of 25 men. On one of the closing days of the work, 30 sections of decking or a total of 405 ft. of new deck, were placed on the structure. Over 200,000 ft. b. m. of Douglas fir was required for the renewal of the bridge floor of this viaduct.

Aside from the methods used in the actual installation of the new decks, special interest is attached to the manner in which the timber was treated with creosote by dipping. This process together with the boring of the pieces preliminary to dipping was conducted very largely with power equipment. Because this work is on an electric line affording current for electric tools under practically all circumstances, some of the methods used do not apply directly to steam railroad practice but the following description used may be read by men engaged in similar work on steam roads from the standpoint of the possible substitution of equipment applicable to steam railroad use.



Four Steps in the Preparation of the Deck

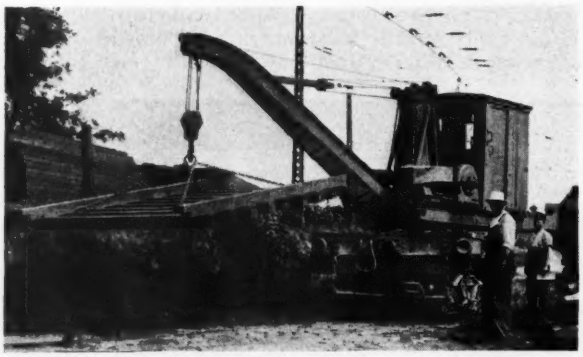
Boring Ties With a Power Drill — *Bundling Ties for Treatment*

Dipping the Timbers — *Making Up the Units*

The work involved in the conduct of this renewal project included the framing and boring of the ties and timber guard rails, the dipping and draining operations

of the treatment, transportation to the site of the bridge, assembly of the timbers in units, the removal of the old deck and its replacement by the new sections. The framing of the timbers and their treatment were carried on in a yard remote from the structure, while the assembling was done in a space conveniently available to the east end of the bridge. All of the timbers were framed and bored for all bolt holes and also for the track spikes before the treatment.

The manner in which the holes were drilled is shown in one of the photographs. An electrically-operated drill was mounted on a frame supported by a vertical mast on which it was free to move up and down while being suspended from a pulley with the aid of a piece of cord and a counterweight. This drilling rig was mounted at or near the center of a bench fitted with rollers for feeding the timbers to the drill and removing



One of the Deck Units Ready to Place

them after they were completed. This enabled the operators to handle the timbers rapidly with a minimum of fatigue.

All the timbers used in the renewal of the deck on the Wells street structure were treated in creosote oil at a temperature of 180 to 200 deg. F. for a period aggregating one hour for each inch of thickness of the stick. After the time thus calculated had elapsed the oil was required to cool to a temperature of about 100 deg. F. before the timbers were removed. The process thus carried out permitted two charges in each 24 hour period for pieces six inches thick and three charges for plank two inches thick. Subsequent to the completion of this particular work this treatment has been superseded by the hot and cold tank process of dipping.

The dipping vat consists essentially of a steel plate tank of sufficient size to receive a bundle of 24, 6 in. by 8 in. ties of the length used on the bridge. The tank was equipped with the steam pipes necessary for heating the oil to the desired temperature. The manner of assembling the bundles is also shown. All the sticks were separated from each other by strips to insure a free movement of the oil throughout the bundle which was enclosed in two frames of channel irons to facilitate lifting. After a bundle had been submerged in the oil for a sufficient length of time, it was withdrawn and placed on a dripping table or platform erected along side the tank from which the surplus oil could flow back into the treating vat. After the treated bundle had been removed, a fresh one is inserted in the tank and then the one previously removed was placed on top where it served to hold down the bundle in the vat, but also permitted the drippings to fall directly into the tank.

The units of the deck consisted of nine 6 in. by 8 in. ties of which all were 8 ft. long except every fifth one which was made 12 ft. to carry an overhanging sidewalk and railing; 6 in. by 6 in. guard rails along each side served to hold the units together.

To replace the old deck by the new one, one track of the viaduct was taken out of service. The running rails and steel guard rails were then removed with the help of a derrick car, being disposed of for the time being by laying them down between the rails of the operated track. All the old timbers were removed and loaded on cars. The new sections were picked up in turn by the derrick cars, hauled out onto the structure on the operated track and set into place. This method of handling the work made it possible to secure a high rate of progress. A further factor in speeding up was a plan for paying a bonus to the men for completing the work within a specified time under certain well-defined conditions. This work was all done by the Way and Structures department of the Milwaukee Electric Railway & Light Company, under the direction of R. H. Pinkley, engineer of way and structures, Milwaukee, Wis.

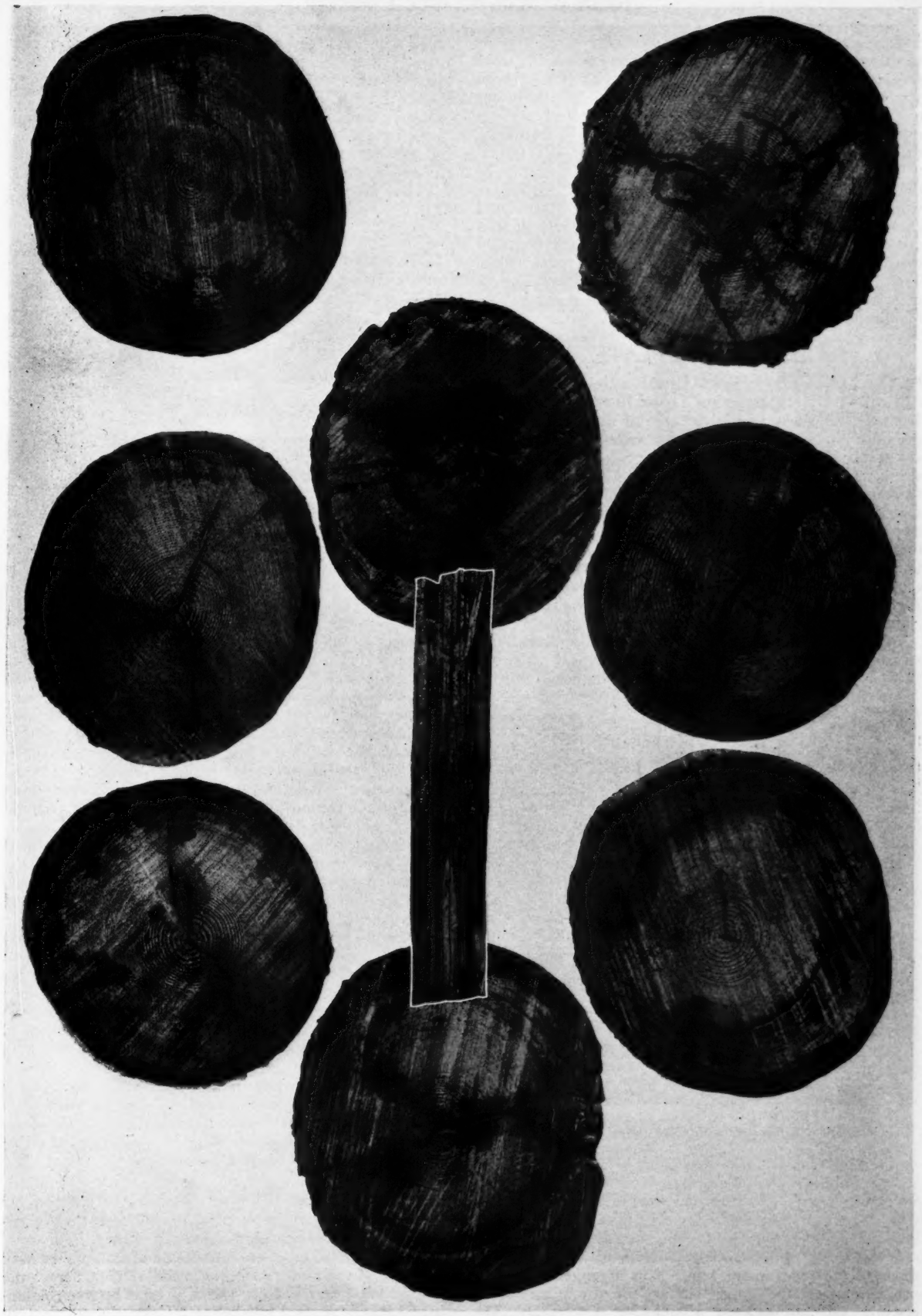
AN UNUSUAL RECORD FOR CREOSOTED PILES

THE PRESERVATION of piles so that 67 per cent were suitable for redriving after 29 years' service in teredo-infested waters is the remarkable record established by the Southern Pacific in its Long Wharf at Oakland, Cal. This structure extends out from the Oakland shore into San Francisco Bay for approximately one mile, terminating in five docks, which are used for the transfer of freight between cars and boats. It was originally built of untreated piling, but was later rebuilt with creosoted piling, dock "A" being redriven with creosoted piles in February, 1890; dock "B" was so redriven in 1898, dock "C" in 1897, dock "D" in 1899 and dock "E" in 1901. It is estimated that over 14,000 creosoted piles have been in service in this wharf for periods ranging from 22 to 29 years.

Because of the expiration of the charter for this structure which could not be renewed because it interfered with plans for municipal water front developments, this dock was ordered entirely removed. When wrecking this structure it was decided to examine a number of these piles to ascertain their resistance to decay and to the attacks of the marine borers which infest the waters on the Pacific coast. These piles were of a good quality of Douglas fir and were well seasoned before and after treatment. These were creosoted at the Southern Pacific plant at San Pedro, absorbing 14.17 lb. of creosote for each cubic foot of timber.

The photographs testify to the remarkable resistance of these piles for so long a period of service. The thin shell of treatment around the circumference except where season checks permitted deeper penetration is characteristic of the preservation of Douglas fir. It is noteworthy that this thin shell of timber treatment provided adequately where the timber had not been punctured by accidents or careless handling.

A committee of railway officers and others interested in timber treatment made an examination recently of 600 of these piles which had been withdrawn and found that 67 per cent were in first-class condition, 9 per cent had been slightly attacked by limnoria and teredo, 18 per cent severely attacked and 6 per cent destroyed. A further extensive examination and inspection was made of a number of piles then remaining in the structure. Out of 523 piles examined in dock "C" 333 were free from attack, and 74 showed evidence of having been attacked



Samples of Air, Water and Mud Sections Sawed from Piles After 29 Years' Service in San Francisco Bay

by borers, while 116 were not fit for redriving. An inspection of 1,090 piles in dock "D" showed that 829 were free from attack, 162 showed evidence of having been attacked, and 99 were unfit for redriving. Similarly out of 2,485 piles inspected in Dock "E" 1,900 were free from injury, 240 showed evidence of attack and 345 were considered unfit for redriving.

The condition of the piles in this structure was so good that the Parr Terminal Company of San Francisco, which is now constructing warehouses, shipyards and coal depots on the western waterfront at Oakland not far distant from the Southern Pacific wharf, arranged to use a large number of these piles in its new construction. The United States Government is also using some of the piles from the same structure in wharves which it is building at Goat Island.

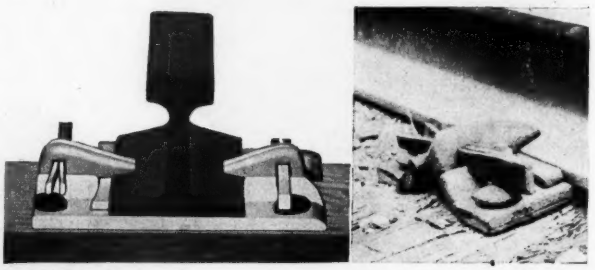
A NEW TIE PLATE

THE COMMON PURPOSE OF a tie plate in standard track construction is to distribute the load from the rail over a sufficient area of the tie so that the pressure on the wood will not exceed its crushing strength. Another purpose is to prevent the rails from sliding or overturning on the ties. It is of interest therefore that a new tie plate is now being introduced for which claims of utility on two additional counts are being made, namely that it prevents the spikes from lifting and that it provides for shifting the rail to take up flange wear on curves without redriving any spikes or moving the plate. This new tie plate is known as the McSafety tie plate, and is manufactured by the Railway Safety Tie Company, Milwaukee.

In this new appliance the rail is held in place by a special fastening entirely independent of the four spikes that hold the plate down on the rail, although a portion

Track Section Equipped with Tie Plates, Near Milwaukee

of the fastening is so located as to offer an obstruction to the withdrawal of the spikes from their holes. The tie plate proper is cut from flat steel or iron plate. Each end is split in the middle by a vertical cut extending in about 2½ in. from the edge. The two edges of these cuts are bent up to an angle about 45 deg. so as to separate the edges about 1 in. This arrangement forms projections on the upper surface of the plate which restrain the rail against a sidewise movement. The main purpose, however, is to form the sockets for the rail clamps. These are small forgings with a nose that projects over the top of the rail flange and a wedge-shaped base that fits into the recess under the plate formed by bending up the edges of the cut. The rail clamp is kept in place and held in bearing on the rail flange by a split key driven through a slot in the clamp and passing over the upturned edges of the plate which are also slotted slightly to prevent the key and clamp from backing away from the rail. This key, when in



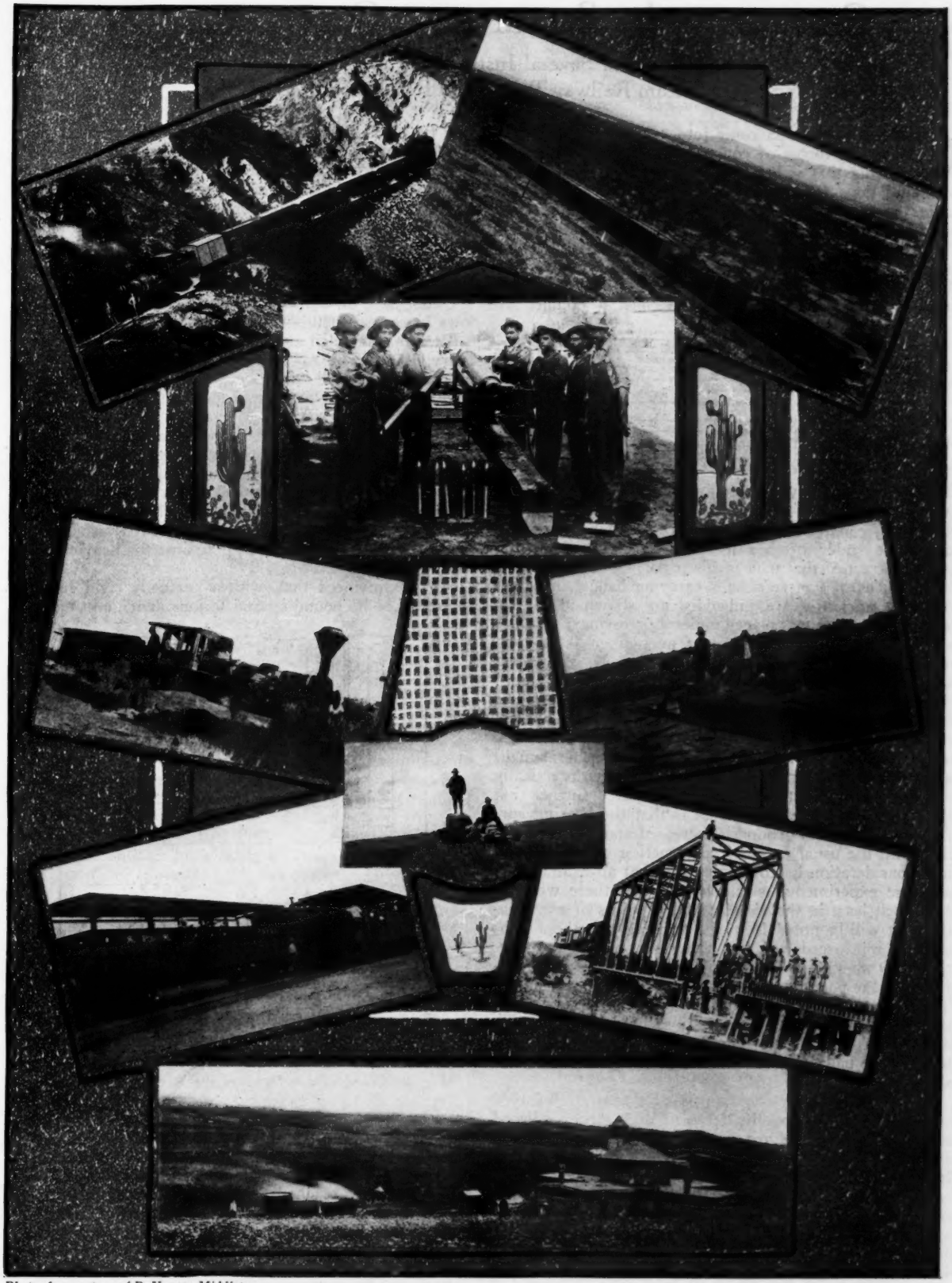
Two Views of the New Tie Plate

position, passes directly over the two spikes that hold down the plate on that side, so that the spikes can raise but a very small amount before being stopped by the key.

The device has one further feature. The distance between the interior faces of the two bent-up portions of the plate on the two sides is slightly greater than the width of the rail base. This excess width, ¼ to ½ in., is taken up by inserting a flat strip of steel that fills the space snugly. When installing tie plates of this kind on a curve the plates for both the inside and outside rails are installed with these strips of metal on the gage side of the rail. As the outer rail of the track becomes flange worn, thereby increasing the gage distance, these strips of metal on the tie plates of one rail, and later on the other rail, can be transferred to the outer side, thereby decreasing the gage distance by an amount equal to the width of the strip. Thus means are afforded for adjusting the gage without disturbing the tie plate or the track spikes.

This device has been subjected to two service tests under heavy traffic conditions. One of these covers the application of the plates to alternate ties on a 17 deg. curve on one of the approach tracks to the Chicago, Milwaukee & St. Paul station at Milwaukee. While this installation is not sufficiently complete to illustrate the holding power of the appliance, it has demonstrated the ability of the fastenings to remain intact after 18 months of service under exceedingly heavy traffic. The other installation is complete for all of the ties on two rail lengths of a three degree curve on the east bound one per cent down grade track of the Chicago & North Western at Layton Park, this being a portion of the Milwaukee-Madison line of that road which also serves as a link in the belt line around the city of Milwaukee over which about 100 trains pass daily. The tie plates were installed on September 17, 1918, and are in effective service today after nearly a year's trial.

A CHICKEN COME TO ROOST.—Pacific Electric box car No. 2586, which left the shops of the builders, the American Car & Foundry Company, at St. Louis, in December, 1913, arrived on home rails for the first time on May 18, 1919. In the interval it had made 17 trips across the Middle West and Eastern states, 3 trips between Atlantic and Pacific ports, 1 trip between Colorado and Eastern states and 2 trips between Eastern states and Texas.



Photos by courtesy of P. Harvey Middleton

RAILROADING IN THE LAND OF THE MEXICAN BANDIT

Entrance to a Tunnel *Gun Made in a Railway Shop* *At Chirimoya Hill on the Mexican National*
Engine Stripped of Brass *All that Remained of One Road's Equipment* *What Was Left of a Roundhouse*
Armored Car on Southern Pacific of Mexico *Drilling Bridge Seat Preparatory to Blowing It Up*
Blockhouses Every Four Miles Between Mexico City and Vera Cruz, in Addition to Guards on Trains

CONCRETE IN SUBGRADE CONSTRUCTION

Descriptions of Several Installations in Service Under Steam Railway Tracks and Results Secured

CONCRETE HAS come into such wide use in almost all forms of construction that it is not surprising that it has been employed in the building of foundations for steam railway tracks. The developments of this nature were the subject of a paper presented before the recent annual meeting of the American Concrete Institute at Atlantic City, N. J., by A. C. Irwin of the Portland Cement Association, Chicago. After discussing the shortcomings of the present forms of track construction, Mr. Irwin described a number of

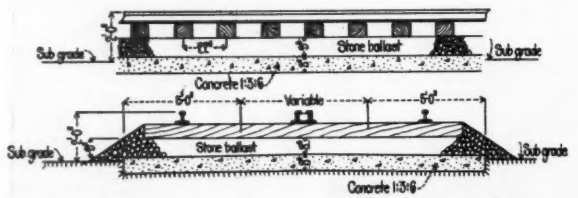


Fig. 1—Concrete Slab in Service on the Long Island

designs of concrete subgrade construction which are now in service under steam railway tracks. The following is an abstract of that part of his paper.

Examples of concrete slabs carrying ballast in which ordinary track ties are embedded are shown in Fig. 1. This construction was placed under 49 crossings, switches and slips on sand embankments averaging 20 ft. high on the Long Island Railroad at Jamaica, N. Y., during the winter of 1912-13. Portions of the slabs were placed without allowing time for the embankment to settle. The traffic over these slabs has been extremely heavy from the day they were put in, running as high as 1,300 train movements per day. After 3½ years the general manager of this road reported that there had been practically no maintenance on these tracks. He stated further that the great advantage of the slab is that the bearing surface on the natural ground is increased about three times that with the usual form of construction without taking into consideration its continuity and that an examination of these experimental slabs showed that there were no cracks, at least in the vicinity of the points of examination. It will be noted from the drawing that these slabs are not reinforced and that they are only eight inches thick. It should also be noted that they have been subjected to the pounding that occurs at crossings and frogs. There can, therefore, be no question of its practicability under main line tracks, but where so used it would seem appropriate to construct curbs at the ends of the slabs to hold the ballast from spreading, and to reinforce the slabs.

It has become very common practice to use reinforced concrete slabs to form the decks of deck girder railroad bridges. These slabs are usually about 1 ft. thick and 5 ft. long and span the distance between girders. The ballast is retained by curbs at the ends of the slabs. The testimony of railroad officers is that when the ties are once embedded they stay in place and maintenance is very greatly reduced.

In the new Bergen Hill tunnel of the Delaware, Lackawanna & Western, completed in 1909, the tracks are carried on reinforced concrete slabs, details of which are shown on Fig. 2. This construction was designed by Lincoln Bush, then chief engineer of the D. L. & W. The tie blocks are notched at the outer end to form a shoulder and are in place when the concrete is poured. A wedge is driven in between the concrete and the opposite side of the block, preventing the block from being disengaged from the shoulder under traffic. The blocks are replaced by removing the wedge, pushing the blocks lengthwise of the track so as to disengage the shoulder, and slipping them from under the rail. This work can be done by one man.

Under date of October 3, 1916, Mr. Bush said as follows in regard to this construction:

"It was completed and turned over for service in February, 1909. The roadbed in the new tunnel has stood up exceedingly well and none of the creosoted tie blocks have been renewed so far as I have learned on recent inquiry.

"My idea in getting out this design was that if railroad track could be made perfectly rigid and unyielding there would be no pounding or unusual stress in the rail. The roadbed in the new tunnel referred to has been in service under the heaviest kind of traffic since February, 1909, and has demonstrated fully that, if track is made perfectly rigid, it will stand up against the heaviest kind of traffic.

"I am convinced that, with a perfectly rigid surface, there will be no pounding and serious damage in railroad

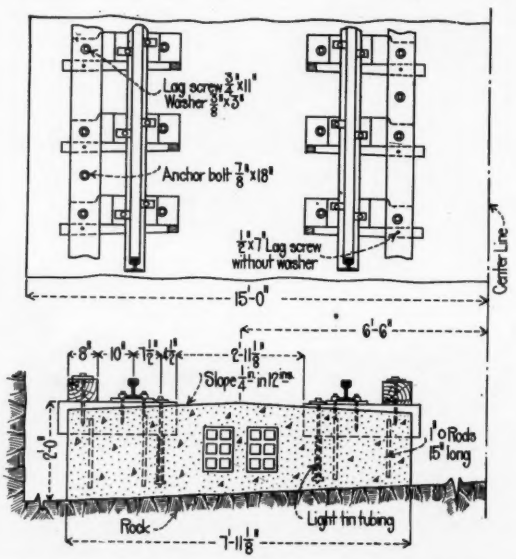
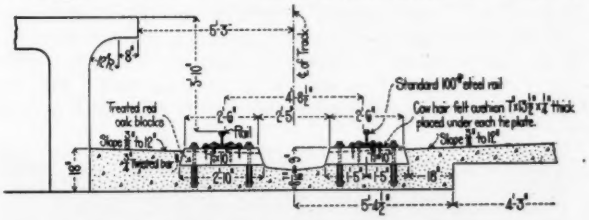


Fig. 2—Construction Used in the Bergen Hill Tunnel

track unless some defect exists, such as flat wheels. Such conditions, however, are corrected when they do arise with the railroad rolling stock. I have felt for some time that, with the heavy rolling stock, the best ballasted track had practically reached the limit of loading and if the heavy rail is used the support of same on tie ballasted track is not like the abutment of a bridge as ties yield, causing deflections in the rails, and it will be found that even with a heavier rail the stress may be greater in the rail than with a light and less stiff rail section which lends itself more readily to deflection."

Figure 3 shows the concrete track construction in use

in the Pennsylvania station in New York City. A single-track length of 14,600 ft. of this type was laid adjacent to platforms. In general the concrete was laid on the rock of the subgrade, but where the subgrade consisted of loose rock backfilling, the concrete slab was reinforced. A length of 720 ft. of similar construction is in use in


Standard 100# steel rail
Treated red oak blocks
Cow hair felt cushion
placed under each tie plate.
Slope ½" to 1'
Slope ½" to 1'
Tie
Tie
Tie

are used at the other end of the tie blocks with one leg of the "L" resting on top of and fastened to the tie block. This allows the track to be lined and gaged. These slabs are cast in widths of 32 ft. 11 in.

Type No. 3 is shown in detail in Fig. 10. The distinguishing features of this type are that the concrete is

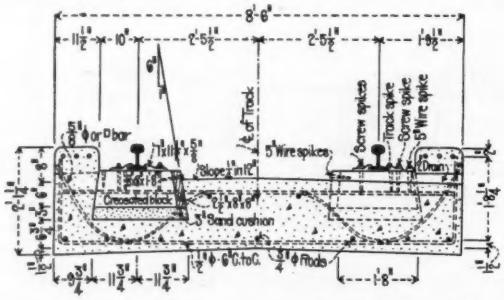


Fig. 8—Type 2, Used by the Northern Pacific

carried up 3½ in. near the inside of each rail and sloped to the center of the track for drainage, and that the rail rests directly on a continuous longitudinal stringer of 6 in. by 10 in. creosoted fir. These stringers are fastened at intervals by long lag screws driven into wood anchor blocks embedded in the slab. The slabs have a depth of 18 in. at the center and were molded in lengths of 16 ft.

Fig. 9—Photograph of Type 2 on the Northern Pacific

5½ in. There is a total of 810 ft. of single track of Type 3 and Fig. 11 shows the appearance of the track in service.

While neither the first cost of the concrete track foundation on the Northern Pacific nor the annual maintenance cost are available, the railroad officers say that the maintenance has been far below that of track of the ordinary type of construction on the same line. The

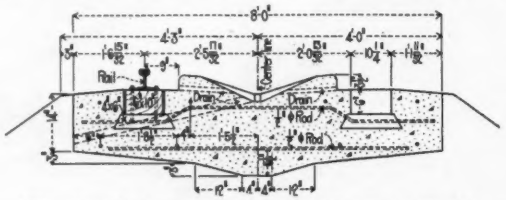


Fig. 10—Type 3, Used by the Northern Pacific

greater part of this maintenance concerns the wooden blocks to which the rails are fastened, especially with Type No. 2.

Fig. 12 shows a suggested design for concrete track support prepared by A. D. Whipple and the writer. The form work required for this slab is of the simplest sort. The design of the slab is based on Cooper's E-60 loading with 100 per cent impact. This design does not require any radical departure from the usual type of rail fastenings; that is, a rail clip is used similar to those now standard. There is, however, a great difference between this rail fastening and the usual cut or screw-spike used with wooden ties. In this concrete design a U-shaped casting is embedded in the concrete and the upstanding legs of the U are tapped to receive the threaded end of holding-down bolts which pass through the rail clips, tie plate and tie block. A positive fastening which has great strength against lifting the rail is thus secured. The use of a block of wood under the rail in this design is at

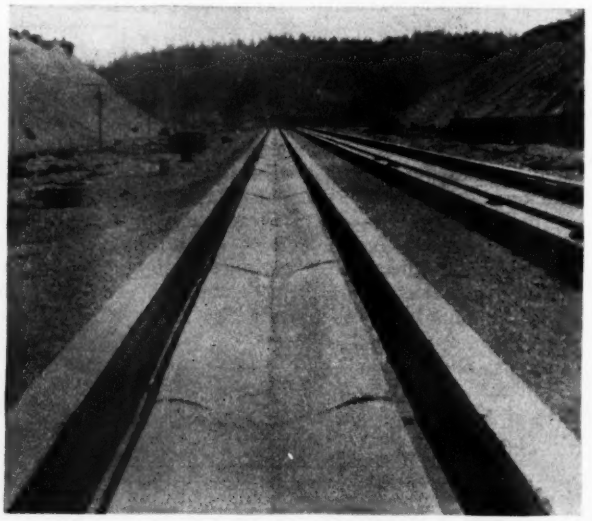


Fig. 11.—A Stretch of Type 3 on the Northern Pacific

once a concession to the prevalent idea that some elastic medium must always intervene between a track rail and a solid foundation and a means for easy adjustment of the rail both vertically and horizontally to provide for whatever inequalities may exist in the top of the slab either at the time of placing or subsequent thereto. The latter is the only sufficient reason for using this tie block, and where the slab is placed on a well-compacted subgrade the rail may be anchored directly to the concrete, with possib-

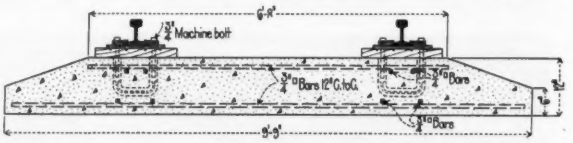


Fig. 12—Character of Construction Suggested by the Author

ly the intervention of a longitudinal steel plate between the rail and the concrete surface, thus affording the rail a continuous support. In the latter case drainage would be taken care of by finishing the slab to a slight pitch between the rails and furnishing openings beneath the rails at intervals.

ECONOMIC CONSIDERATIONS

In the final analysis, the use of concrete track construction will be governed by economic factors. Will it pay? Will the economies and advantages derived from it afford an adequate return on the cost of installing it?

Lincoln Bush, in an article published in the Railway Age Gazette of April 23, 1909, shows comparative tables of the cost of ballast and tie double track construction and the concrete slab. The cost of the latter from actual figures and the estimated cost of ballast and ties was care-

fully prepared from data known from experience to be correct. Annual maintenance and renewal costs used were similarly reliable and the result shows an earning on the extra cost of concrete slab construction of over 40 per cent per year, due to savings in maintenance and renewals.

A recent letter from Mr. Bush says:

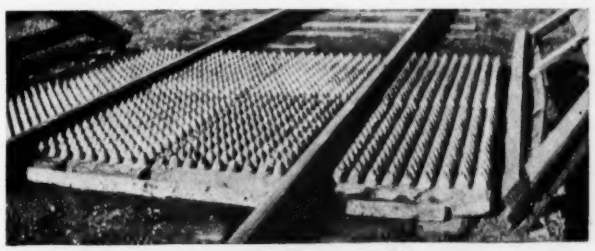
"Bergen Hill tunnel track has now been in service under very heavy traffic over 10 years and has fully demonstrated all I believed it would do and is in good condition."

L. V. Morris, chief engineer of the Long Island Railroad, said in regard to an adaptation of the design shown on Fig. 1 to main line service:

"In constructing a new line I cannot conceive that the cost would be over $2 per running foot, single track, for a slab 10 ft. wide and 8 in. thick. This would be in the neighborhood of $10,000 per mile and is a very small part of the total cost of a modern roadbed which I have in mind running anywhere from $100,000 to $200,000 per mile, single track. It seems to me that this expense is justified, particularly as it supports practically the only working part of the roadbed. This working part, namely, the track, is the most expensive to maintain and upon its condition depends largely the wear and tear of the rolling equipment."

A CONCRETE CATTLE GUARD

A UNIQUE FORM of cattle guard has been developed on the Chicago, Burlington & Quincy Lines West of the Missouri River, which, while its use has been restricted, has been subjected to service tests over periods up to seven years' duration in Colorado and Wyoming. The guard is made of concrete slabs in which the upper surface is made up of cones spaced 3 in. center to center in both directions, each cone having a base diameter of 2⅞ in. and a height of 2½ in. Each cone is reinforced by a spike placed axially, the point of which protrudes from the top from ⅜ in. to ½ in. The slabs are made 4 ft. long by 2 ft. 2½ in. wide, using eight to a crossing. They are held in place by their own weight



Concrete Cattle Guard in Service

without any fastenings except that cleats are spiked to the ties at each end of the slabs to prevent their creeping with the traffic.

Installations are in service at Peetz, Padroni and Lorenzo, Colo., and at Lodge Grass and Lovell, Wyo., with uniformly satisfactory results in keeping out horses and cattle. In one or two instances stock has crossed the guards once, but did not offer to cross a second time. There has been some criticism to the effect that the guard is unnecessarily cruel and in one instance the railroad was compelled to pay a claim for injury to stock sustained in crossing the guard. In another instance the points of the spikes were bent over maliciously by stock men. Both of these difficulties are now overcome by shortening the protruding length of the spike so that the point is practically flush with the top of the concrete cone. Dragging brake beams have also caused damage to the guards, knocking off the tips of one or more rows of cones and bending over the spikes, while cinders dumped on the guards also tend to destroy their effectiveness, but the general opinion after the experience with the various installations is that the guards are more efficient than other forms used in the same territory.

This type of cattle guard was developed by J. H. Ellis, storekeeper for the Burlington at Hannibal, Mo., where the guards have been built under his direction. Typical figures for the cost of these guards are given below:

Eight sections of guard complete	$13.44
Installation cost	2.83
Total cost for complete guard in place	$16.27

We are indebted to F. T. Darrow, assistant chief engineer, of Burlington Lines west of the Missouri river, for this information.

CONTAMINATING A WATER SUPPLY BY STORAGE COAL

A RECENT EXAMPLE of water supply contamination occurring at a small middle western engine terminal, emphasizes conspicuously an unexpected source of pollution possible in railroad water supply. The water at this point is drawn from two shallow, gravel type wells approximately 45 ft. deep and 400 ft. apart, and is pumped by vertical centrifugal pumps run by electric motors. The usual delivery rate varies between 125 and 200 gal. per minute per well, and the consumption averages 200,000 gal. per day. The wells are located about 1,000 ft. from the roundhouse. The yard is built mostly on a sand fill with a comparatively small amount of cinder ballast. The terminal is situated in a small river bottom, with the surrounding country fairly level, drainage facilities being poor.

In the early summer of 1918, in view of a prospective coal shortage, this terminal was designated as one of the points for storing a surplus coal supply. The coal was of the bituminous type common to certain middle western districts, and was unloaded in piles of approximately 400 tons. The maximum storage of about 30,000 tons was reached in December, the piles covering ground adjacent to yard tracks and between and beyond the locations of the wells.

Early in January it was noted that trouble was being reported with engine boilers, leaky flues and cracked stay-bolts, developing to a considerable extent beyond what would be warranted by ordinary circumstances. Flues removed showed a very hard scale accumulation not in keeping with the usual conditions and pitting was noticeable. Samples of the water supply were forwarded to the chemist about the middle of January. The original quality of the water was not extremely bad, having tested 15 grains per gallon of scaling matter present, mostly calcium and magnesium carbonates. However, results of analyses of these new samples developed the fact that a considerable change had taken place, the carbonates having been reduced to 8 grains and the total hardness increased to 25 with an increase also in the sodium chloride content, this water being one which would form a very hard, flintlike scale.

An investigation was started at once to ascertain the source of contamination. Samples of water were furnished regularly from both wells, and these showed not only a variation between each other, but also a fluctuation of total solids of between 20 and 60 grains per gallon. Samples from wells in the vicinity showed similar contamination within a radius of one-quarter mile, but in wells beyond there had been no change. This indicated strongly that local drainage was the conveyor of the pol-

lution with the storage coal piles as the possible source, this being the only changed condition from previous years.

Samples of coal from the storage piles were sent to the laboratory, together with samples from cars fresh from the mines. When part of these samples were digested in water at the laboratory, water drawn from the storage coal showed that the carbonates were entirely eliminated, leaving residual acidity and a strong increase in hardness. The fresh coal had but little effect upon the water even after 30 days' leaching. This indicates that the weathering had oxidized the iron pyrites in the stored coal with the subsequent liberation of the sulphuric anhydride, which was changed to sulphuric acid or incrusting sulphates and carried away by drainage or soaked into the ground.

Government analyses of coal from the mines have shown from 2.86 to 5 per cent sulphur. Check analyses of the coal from storage piles tested but 1.45 per cent sulphur, indicating that some possible 200 tons of sulphur, or around 160,000 lb. of sulphate compounds, had been leached out of the coal to be carried away by drainage, either surface or sub-surface.

As a measure of relief the coal was cleaned up between the wells and also removed from a radius of 300 feet. This helped and the wells are now gradually returning to normal, although one appears to be more in the channel of the underground flow from the coal pile drainage and consistently shows a poorer quality than the other. It is still noted that after heavy rains the hardness of both wells increases considerably and from 3 to 10 days are required before a decrease is noticeable. It will undoubtedly be some time before the trouble is entirely removd, as white discoloration remains on the ground around coal piles similar to alkali deposits.

As a means of permanent relief for locomotive boiler troubles, a complete water treating plant is contemplated at this point, as this will also give economical returns with the normal quality of the water. As a temporary expedient, pre-determined amounts of soda ash are added directly to the engine boilers when they are washed, and also in tenders when they are filled.

This incident emphasizes the fact that local water conditions and drainage, including porosity of soil, should be given careful consideration in the storing of coal.

Protecting River Banks With Steel Jetties

BY F. T. MORSE

Office Engineer, Atchison, Topeka & Santa Fe, Topeka, Kan.

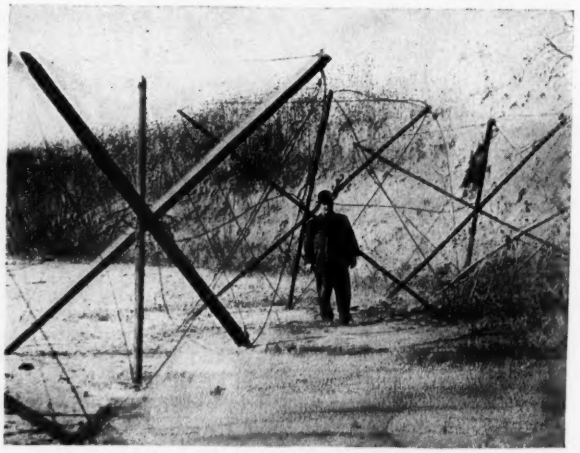
A NEW FORM of river bank protection has been developed and placed in service which embodies the application of a new material to an old idea. It has been used along the Kansas or "Kaw" river in the vicinity of Topeka, Kan., for several months with encouraging results.

This is a jetty which consists of one or more units, preferably at least four, and each unit consists of three

Deposit of Sediment Resulting from the Presence of Two Jetties

structural steel angles, 16 ft. long, properly fastened together in the center in the form of a jack stone, such as children use in playing jacks. The extreme ends of these three angles are fastened one to another with half-inch wire cable. Various sizes of angles have been used. The four or more units are fastened one to another by wire cable, attached to the center of each unit, and this cable is fastened to a dead man some distance from the bank. The material is shipped in a knocked-down condition to the point of use. There each unit is assembled on the bank, the several units are properly tied together with one end anchored to the shore, and the whole jetty is rolled into place in the stream.

The effectiveness of this jetty arises from the fact that it decreases the velocity of the water passing through it sufficiently to deposit some of the sand being carried down stream by the swift current, and once a deposit is started it continues rapidly. Of course, brush catches in the prongs of the affair, but the jetty is not dependent upon this brush for results. The builders claim better results where no brush interferes. Should brush lodge



One of the Steel Jetties Just After Placing

and overturn the jetty, it is in the same position as before and unharmed.

The advantages of this device lie largely in its relatively cheap installation cost and to the short time required to place it, as compared with other means of bank protection. Experience with this construction indicates

that the results are satisfactory. Then, too, the effect of this jetty in pushing the river away from the point of cutting is only moderate, so that the current is not turned sharply away only to have it do even greater damage at some point further down stream.

One photo shows a jetty just after installation. The other picture shows clearly that a bar or deposit is forming below the point where two jetties had been placed. The river had given more or less trouble here, and considerable money had been spent in a small way without much success until this jetty was placed, in the fall of 1918. The picture was taken just after the heavy rains, and high water of March, 1919. In all of 37 places where jetties of this kind have been installed the river has stopped cutting.

If the protection is required for some distance along the river, it is necessary to place the jetties at intervals of from two hundred to three hundred feet. These jetties were developed by J. W. Kellner, manager of the Steel Jetty Company, Silver Lake, Kan., and are covered by patents.

A FORM FOR COMPARISON OF LABOR CHARGES

A FORM FOR THE daily and cumulative tabulation of labor engaged in maintenance of way work has been devised in the office of the director of the Allegheny region, United States Railroad Administration, and was put into effect on the roads in that region on April 1. This report is prepared for the use of supervisory officers in checking the actual labor employed in comparison with that estimated in the monthly budgets and authorized. On one side is the daily report, while on the reverse side is the cumulative report from the first of the month up to and including the date shown on the first side. By means of this report the supervisors are able to inform themselves daily of the adherence of their forces to the scheduled program and to detect and correct excesses or deficiencies before the end of the month. The illustration shows a typical report made out on one supervisor's district in this region.

UNITED STATES RAILROAD ADMINISTRATION
Director General of Railroads
ALLEGHENY REGION
A B & C Railroad
DAILY REPORT OF MAN HOURS
May 5 1918

DEPARTMENT OR OFFICE	CODE	HOURS WORKED			
		Straight Time	Overtime	Total	Allotted
		B	C	D	E
H A Johns					
Sec #14	F	80	10	90	90
13	G	72	23	95	90
12	H	72	18	90	90
11	J	64	8	72	81
10	K	64	8	72	81
9	L	56	7	63	81
8	M	72	9	81	81
7	N	80	10	90	81
6	P	56	7	63	81
5	R	56	7	63	81
4	S	88	11	99	135
3	T	48	6	54	54
2	V	48	6	54	54
1	W	40	5	45	45
36	X	88	11	99	117
37	Y	48	6	54	81
38	Z	64	8	72	81
39		72	9	81	81
TOTAL	Zs				

UNITED STATES RAILROAD ADMINISTRATION
Director General of Railroads
ALLEGHENY REGION
A B & C Railroad
CUMULATIVE REPORT OF MAN HOURS
May 5 1918

DEPARTMENT OR OFFICE	CODE	CUMULATIVE HOURS WORKED			
		Straight Time	Overtime	Total	Allotted
		B	C	D	E
H A Johns					
Sec #14	F	309	38	347	365
13	G	275	51	326	365
12	H	277	41	318	365
11	J	245	30	275	329
10	K	285	35	320	329
9	L	253	31	284	329
8	M	293	36	329	329
7	N	309	38	347	329
6	P	229	28	257	329
5	R	277	34	311	329
4	S	379	61	440	545
3	T	197	24	221	221
2	V	197	24	221	221
1	W	160	20	180	180
36	X	350	35	385	473
37	Y	197	24	221	329
38	Z	269	29	298	329
39		293	84	377	329
TOTAL	Zs				

Two Sides of Card for Labor Time Record

TO REHABILITATE TRANS-SIBERIAN.—The President has agreed to advance $5,00,000 as the share of the United States for the relief of the Trans-Siberian Railway.

From Asia, Journal of the American Asiatic Association

Ruins of Bridge Over the Anon River in Siberia, Destroyed by the Bolsheviki

Activities of the Railroad Administration

New Instructions to Govern Maintenance Expenditures

Statement of Estimated Cost of Work to be Done In 1919

Washington, D. C.

THE MAINTENANCE department of the Railroad Administration is very busy these days with the figures showing the situation as to maintenance of way expenditures on the various roads, in the effort to prevent so much money being spent on roads as to which the administration believes it is up to its contract obligations that there will not be enough to spend on roads that need it more. The situation is being handled by instructions to the regional directors regarding the expenditures on individual roads as to which the figures indicate that more has been expended than the contract calls for.

Maintenance Instructions for Last Six Months of 1919

New instructions outlining a working basis for maintenance of way expenditures for the last six months of 1919 were issued to the regional directors by W. T. Tyler, director of the Division of Operation, early in July. They supersede to some extent previous instructions, and particularly the order to limit maintenance of way expenditures for June to the average test period of such expenses to operating revenues, which was merely a temporary order intended to hold the situation in check until more explicit directions could be issued.

While the new instructions are tentative and temporary, in order to control maintenance of way expenditures month by month during the remainder of 1919 to the end that the contract obligations of the Railroad Administration to the railroad companies may be fully complied with but not exceeded, they provide a definite basis on which maintenance officers may proceed as well as prescribing the character of the information which is to be used as the final standard. In the normal case the program to be followed will be determined tentatively, as it has been in the past, by considering the amount of work necessary to make the average for 1918 and 1919 match up with the average for the test period, but in order to determine whether this is a fair basis the 10 years before federal control are to be considered. Mr. Tyler's letter to the regional directors emphasizes that, whereas there has been a general tendency to accept the test period standard as the yardstick by which to determine the contract obligations, this may not be the proper absolute standard in many instances, and the entire obligation of the government is to make such expenditures upon the properties, equated as to the prices and wages obtaining during the period of federal control, as will result in returning them to the companies at the end of federal control in substantially as good condition and in substantially as complete equipment as when they were taken over. The government has the option to treat the quantities of labor and material used during the test period, modified by the volume of business done, as the maximum of its obligations.

The officers of the Railroad Administration have devoted a great deal of time to the preparation of these instructions, which are based on recommendations made at a conference of the engineering assistants to the regional directors with A. M. Burt and W. J. Cunningham, assistant directors of the Division of Operation, on June 20 and 21.

Instructions have been issued to the federal managers and through them to the local supervising officers providing for an analysis of the expenditures during the test period to determine tentatively whether they fairly represent the contract obligations and can be taken as a basis for the expenditures during federal control. In making such analyses the expenditures and quantities of the most important materials during the test period, during the seven years prior to the test period and during the six months between the end of the test period on June 30, 1917, and the beginning of federal control, are to be taken into consideration. It is stated that the maintenance of way expenditures can best be controlled by regulating the number of man hours and also the amounts of the principal classes of materials, such as rails, ties and ballast. The performance of 1918 and 1919 combined should not exceed the contract obligations as tentatively determined by the use of equation factors representing the differences in wages and prices between the test period and the period of federal control. The engineering assistants of the regional directors have already made substantial progress in working out such equation factors for the different roads in their territory. After considering the contract obligations in connection with the expenditures and quantities prior to federal control, each federal manager is directed to furnish a recommendation to his regional director, showing the tentative allowances for 1918 and 1919 as equated, the expenditures made during the period of federal control up to June 30 and the balance remaining for the last half of this year, and to regulate the labor and materials to insure that the expenditures for the remaining period will not exceed the available balance. In special cases where conditions require the performance of a greater amount of work, recommendations of the federal managers, if approved by the regional director, are to be submitted to the director of operation.

If the program for 1919 does not, according to this tentative basis, exceed the contract obligations, the regional directors may authorize the federal managers to proceed with the maximum expenditures necessary to insure the return of the property in substantially as good condition and equipment as on January 1, 1918. Distribution of the work by months is to be made by the regional directors, taking into consideration the conditions that may make necessary heavier expenditures for any month than the average.

As soon as figures are available, the regional directors are to submit statements to the director of operation

for the roads on which the test period expenditures are considered to have been normal, showing the expenditures and equation factors, together with the program recommended for the last six months of 1919, and whether or not this represents an excess or shortage as compared with the tentative balance arrived at by subtracting the actual expenditures for 18 months from the equated expenditures for the two year period. In cases where the test period expenditures are considered subnormal, or abnormal, or where the expenditures during the last six months of 1917 were considered subnormal, special statements are to be submitted reporting the facts with recommendations to cover the qualifying factors. These special statements will cover cases where it will be necessary to make expenditures in excess of the obligation in the interest of safety and also special cases where there have been substantial increases in track mileage or abnormal maintenance or traffic conditions.

Supplementary instructions are to be issued covering the subject of tie renewals.

While the Railroad Administration takes the position that an excess of expenditures for maintenance of equipment on any road may fairly be considered together with, and as an offset against, any deficiency that may result in maintenance of way expenditures on that road, it is stated that it is not the purpose deliberately to curtail maintenance of way in any respect with this in view and the new instructions treat maintenance of way expenditures on their own footing, giving directions for making them comply with the contract requirements independently of the equipment situation. Director General Hines has stated that, taking roadway and structures and equipment together, the average condition of the property as a whole is a well off as it was on January 1, 1918. This is because on some roads the equipment had got into a very run down condition at the end of 1917, as the result of the great pressure that had been put upon railroad facilities, and it was therefore necessary to make very heavy expenditures in 1918 in order to put it in condition for handling the war traffic, at a time when no one then knew how long it would last. Since the armistice traffic has fallen off and there was a mild winter, with the result that a large amount of equipment put in readiness for the winter is now being stored.

Maintenance of Way Expenditures

Expenditures for maintenance of way and structures for the first five months of 1919, for which the figures are now available, were $304,441,957, as compared with $220,567,840 in the corresponding period of 1918, an increase of 38 per cent. For the corresponding months of the test period they were $161,740,000 and as compared with this figure the 1919 expenditures show an increase of 88 per cent. Maintenance of equipment expenses increased 33.6 per cent as compared with last year and 98 per cent as compared with the test period, while total operating expenses increased 25.1 per cent as compared with last year and 79 per cent as compared with the test period. Maintenance of way structures in the first five months of 1919 represented 17.5 per cent of total operating expenses as compared with 15.8 per cent in the corresponding period of 1918 and 16.7 per cent in the test period. For the entire year 1918 maintenance of way and structures represented 16 per cent of the expenses and in the test period the ratio was 17 per cent.

Additional Rail Orders Expected

The Railroad Administration is contemplating placing further orders for rail as it is recognized that more will be needed. It is believed that the next order will be placed in time to allow the steel mills to continue rolling after the recent order for 200,000 tons is completed. The date for the completion of which was changed from July 1, as stated in the request for bids, to July 31.

Congressman Wants Steel Ties Used

The House Committe on Interstate and Foreign Commerce held a hearing on July 19 on a resolution introduced by Representative Dyer of Missouri, providing for an investigation by the Interstate Commerce Commission on the advisability of substituting steel ties for wood ties on railroads. The resolution urged the necessity of its being done in order to conserve the forests. E. H. Clapp of the Forestry Service of the Department of Agriculture, testified that the country's timber consumption was now at the rate of three times the production and that it was necessary to do something to restore a balance between production and consumption. H. T. Douglas, chief engineer of the Chicago & Alton, gave testimony regarding the tie requirements of the railroads and a letter from W. G. Bierd, federal manager of the Chicago & Alton, was presented, in which Mr. Bierd declared that steel ties have progressed beyond the experimental stage.

Railroad Appropriation Reduced

Prospects for any considerable program of capital expenditures for additions and betterments being carried out this year have been effectively dispelled, it is believed, as the result of the action of Congress in reducing the deficiency appropriation asked by the Railroad Administration from $1,200,000,000 to $750,000,000. This was done on the recommendation of the House committee on appropriations, which reported a bill for the reduced amount after a sub-committee had given Director General Hines and Swagar Sherley, director of the Division of Finance of the Railroad Administration, a three-day hearing to explain the requirements. The bill was passed by the House on June 10 by a vote of 305 to 4 and by the Senate on June 12 without a roll call. The Senate committee on appropriations reported the bill as passed by the House without holding further hearings and the Senate passed it within two minutes.

In submitting his request for the appropriation on May 24, Director General Hines gave an estimate of the requirements of the Railroad Administration, including the original appropriation of $500,000,000, divided as follows: For the deficit of 1918 and the first four months of 1919 which he said ought to be charged as a war loss, $486,000,000; for working capital, $425,000,000; for improvements to inland waterways, $14,000,000, and for advances made or to be made for the benefit of railroad companies for capital expenditures and for loans, $775,000,000. All except the $486,000,000 deficit, he said, should eventually be returned to the government. The $775,000,000 was made up of $352,553,000 for capital expenditures not financed by the railroads in 1918; $253,435,000 for similar purposes for 1917, of which $245,000,000 is for standard cars and locomotives ordered by the government last year; $100,000,000 advanced to railroads companies last year to meet current liabilities; $48,483,000 of loans, and $20,000,000 promised to be advanced to carry out the Boston & Maine reorganization.

This left only $8,000,000 which the Railroad Administration had not already expended or committed itself to pay except the working capital, and Mr. Hines stated to the committee that it was not proposed to undertake any improvements not actually necessary for federal

operation unless the corporations will finance them, and he also said that it would be the policy to force the corporations to reimburse the government for what they already owe it "before they go ahead and make a lot of additional improvements to the property."

In reducing the appropriation the committee expressed the opinion that the sum allowed would take care of immediate requirements, although the Railroad Administration estimates its needs only up to July 31 at $1,000,000 000, and held forth a hope that if necessary more could be applied for later in the year. It also placed some dependence on the ability of the railroads to finance themselves and reimburse the government for the capital expenditures it has made for their account, although Mr. Hines and Mr. Sherley had both warned the committee that what the corporations can do in the way of permanent financing after the government has cleared off its current obligations to them for rental, is an entirely different matter from what they could do now. Members of Congress, failing to appreciate the difference between current rental and permanent capital charges, seemed to feel that the obligations of the railroads to the government were a sort of offset to what the government owes them and could be cleared without the medium of an appropriation, although the compensation contracts limit the deductions which may be made from the rental account for additions and betterments to an amount which will not interfere with the payment of fixed charges.

The debate in Congress was not especially friendly to the Railroad Administration but opinions were voiced that perhaps the experience gained as the result of government operation might be worth its cost. "It is a big sum to lose," said Chairman Good of the appropriations committee, "but may it not be, after all, money pretty well spent, especially if it kills the government ownership bug?"

PROPOSED BUDGETS OF ADDITIONS AND BETTERMENTS FOR 1919

Mr. Hines' estimate of the proposed capital expenditures for 1919 was $830,000,000, of which $253,000,000 was to be carried by the Railroad Administration and $576,000,000 was to be financed by the railroads if carried out at all. The item of $253,000,000 consists principally of $245,000,000 to pay for the standard equipment, leaving only $8,000,000 toward new capital expenditures. Aside from equipment, the budgets for 1919 include $584,000,000 for additions and betterments, of which $317,000,000 represents the carry-over from 1918 and $267,000,000 the proposed new work for this year. The following estimated budget of additions and betterments work to be done during 1919 was filed with the House appropriations committee by Swagar Sherley, director of the Division of Finance, although he stated that the amounts to be actually spent, would depend on the ability of the roads to finance:

STATEMENT OF ESTIMATED COST OF WORK TO BE DONE DURING YEAR 1919.

Name of road	1919 budget (exclusive of U. S. R. R. equipment)	1918 carry over (exclusive of U.S. R. R. equipment)	Estimated cost of work to be done during year 1919
1	2	3	4
Alabama & Vicksburg	$47,110	$252,210	$299,320
Alabama Great Southern	1,477,424	25,764	1,503,188
Ann Arbor	42,234	38,360	80,594
Arizona Eastern	149,970	80,177	230,147
Atchison, Topeka & Santa Fe	8,323,255	15,418,168	23,741,423
Atlanta & West Point	291,505	115,870	407,375
Atlanta, Birmingham & Atlantic	1,211,162	61,577	1,272,739
Atlantic & St. Lawrence	110,769	167,507	278,276
Atlantic City	160,642	128,451	289,093
Atlantic Coast Line	870,106	2,033,550	2,903,656
Baltimore, Chesapeake & Atlantic	52,323	.....	52,323
Baltimore & Ohio (inc. C. & C.)	6,789,213	5,825,396	12,614,609
Bangor & Aroostook	157,972	100,931	258,903

STATEMENT OF ESTIMATED COST OF WORK TO BE DONE DURING YEAR 1919—Continued

Name of road	1919 budget (exclusive of U. S. R. R. equipment)	1918 carry over (exclusive of U. S. R. R. equipment)	Estimated cost of work to be done during year 1919
1	2	3	4
Beaumont, Sour Lake & Western	11,920	9,711	21,631
Bessemer & Lake Erie	940,295	902,964	1,843,259
Boston & Albany	2,403,879	1,181,665	3,585,544
Boston & Maine	2,038,494	4,399,976	6,438,470
Buffalo & Susquehanna	36,231	14,832	51,063
Buffalo, Rochester & Pittsburgh	755,812	305,172	1,060,984
Carolina, Clinchfield & Ohio	536,170	1,270,323	1,806,493
Central of Georgia	1,167,888	1,509,777	2,677,665
Central New England	287,137	401,367	688,504
Central R. R. of New Jersey	2,593,779	2,593,862	5,187,641
Central Vermont	96,635	105,356	201,991
Charleston & Western Carolina	56,523	87,165	143,688
Chesapeake & Ohio	2,303,841	8,405,112	10,708,953
Chicago & Alton	1,622,126	1,356,090	2,978,216
Chicago & Eastern Illinois	1,611,458	279,128	1,890,586
Chicago & Erie	413,728	434,084	847,812
Chicago & Northwestern	6,233,164	4,035,058	10,268,222
Chicago, Burlington & Quincy	5,516,456	5,830,584	11,347,040
Chicago, Detroit & Can. G. T. Jct.	3,960	86,465	90,425
Chicago Great Western	370,797	524,388	895,185
Chicago, Indianapolis & Louisville	339,499	316,954	656,453
Chicago, Milwaukee & St. Paul	20,260,218	13,102,851	33,363,069
Chicago, Peoria & St. Louis	1,764	19,615	21,379
Chicago, Rock Island & Pacific (includes C, R. I. & G.)	11,002,274	5,455,590	16,457,864
Chicago, St. Paul, Minneapolis & Omaha	658,697	459,536	1,118,233
Chicago, Terre Haute & So. East.	131,350	30,431	161,781
Cincinnati, Indianapolis & Western	58,260	128,148	186,408
Cincinnati, New Orleans & Texas Pacific	5,000,498	213,038	5,213,536
Cincinnati Northern	97,770	153,238	251,008
Cleveland, Cincinnati, Chicago & St. Louis	2,023,614	5,738,574	7,762,188
Colorado & Southern	882,382	483,090	1,365,472
Cumberland Valley	283,770	596,290	880,060
Delaware & Hudson	1,201,322	622,345	1,823,667
Delaware, Lackawanna & Western	1,020,269	1,113,280	2,133,549
Denver & Rio Grande	1,395,362	1,036,480	2,431,842
Denver & Salt Lake	.....	8,480	8,480
Detroit & Mackinac	.....	840	840
Detroit & Toledo Shore Line	38,925	69,512	108,437
Detroit, Grand Haven & Milwaukee	140,080	111,376	251,456
Detroit, Toledo & Ironton	826,631	346,849	1,173,480
Duluth & Iron Range	293,055	156,951	450,006
Duluth, Missabe & Northern	458,590	640,293	1,098,883
Duluth, South Shore & Atlantic	145,312	14,730	160,042
Elgin, Joliet & Eastern	357,888	319,451	677,339
El Paso & Southwestern	443,442	369,309	812,751
Erie	3,061,123	3,114,225	6,175,348
Florida East Coast	197,370	252,229	449,599
Fort Worth & Denver City	709,266	671,319	1,380,585
Fort Worth & Rio Grande	131,450	18,531	149,981
Galveston, Harrisburg & San Antonio	615,199	1,077,581	1,692,780
Georgia	941,080	191,569	1,132,849
Georgia Southern & Florida	117,270	3,782	121,052
Grand Rapids & Indiana	1,072,348	178,643	1,250,991
Grand Trunk Western	374,817	1,215,931	1,590,748
Great Northern	5,832,660	3,256,834	9,089,494
Gulf & Ship Island	23,350	135,955	159,305
Gulf, Colorado & Santa Fe	465,950	1,508,109	1,974,059
Gulf, Mobile & Northern	81,018	1,360,263	1,441,281
Hocking Valley	402,200	2,993,411	3,395,611
Houston & Texas Central	154,461	1,256,238	1,410,699
Houston, East & West Texas	95,359	18,672	114,031
Hudson & Manhattan	320,800	157,658	478,458
Illinois Central	3,926,522	8,315,789	12,242,311
International & Great Narthern	1,000,700	439,407	1,440,107
Kanawha & Michigan Ry	253,932	487,219	741,151
Kansas City, Mexico & Orient (includes K. C. M. & O. of T.)	12,720	2,525	15,245
Kansas City Southern (includes T. & F. S.)	649,460	1,134,361	1,783,821
Lake Erie & Western	1,277,608	335,466	1,613,074
Lehigh & Hudson River	34,418	24,836	59,254
Lehigh & New England	60,997	139,412	200,409
Lehigh Valley	215,776	5,669,162	5,884,928
Long Island	403,917	477,459	881,376
Los Angeles & Salt Lake	967,173	652,887	1,620,060
Louisiana & Arkansas	37,071	2,716	39,787
Louisiana Western	139,341	20,628	159,969
Louisville & Nashville	5,251,265	5,960,245	11,211,510
Louisville, Henderson & St. Louis	124,229	58,339	182,568
Maine Central	416,000	1,830,134	2,246,134
Maryland, Delaware & Virginia	19,109	.....	19,109
Michigan Central	3,139,467	4,482,486	7,621,953
Midland Valley	252,560	45,820	298,380
Mineral Range	24,265	6,322	30,587
Minneapolis & St. Louis	2,010,994	220,398	2,231,392
Minneapolis, St. Paul & Sault Ste. Marie	1,011,262	577,025	1,588,287
Minnesota & International	16,553	6,512	23,065
Missouri & North Arkansas	47,494	26,529	74,023
Missouri, Kansas & Texas	3,714,718	2,899,708	6,614,426
Missouri, Kansas & Texas Ry. of Texas	53,075	549,990	603,065
Missouri, Oklahoma & Gulf	187,363	.....	187,363
Missouri Pacific	5,444,943	1,234,575	6,679,518
Mobile & Ohio	359,684	144,905	504,589
Monongahela	.....	353,900	353,900
Morgan's Louisiana & Texas R. R. & S. S. Co.	64,520	79,504	144,024
Nashville, Chattanooga & St. Louis	1,155,509	969,939	2,125,448
New Orleans & Northeastern	1,941,105	45,312	1,986,417
New Orleans Great Northern	3,215	44,404	47,619

STATEMENT OF ESTIMATED COST OF WORK TO BE DONE DURING YEAR 1919—Continued

Name of road 1	1919 budget (exclusive of U. S. R. R. equipment) 2	1918 carry over (exclusive of U. S. R. R. equipment) 3	Estimated cost of work to be done during year 1919 4
New Orleans, Texas & Mexico	23,051	35,840	58,891
New York Central	14,912,489	21,772,130	36,684,619
New York, Chicago & St. Louis	1,712,947	23,186	1,736,133
New York, New Haven & Hartford	8,259,077	8,303,986	16,563,063
New York, Ontario & Western	163,826	86,501	250,327
New York, Philadelphia & Norfolk	31,895	86,640	118,535
New York, Susquehanna & Western	127,250	198,193	325,443
Norfolk & Western	4,945,275	13,200,075	18,145,350
Norfolk Southern	344,722	187,048	531,770
Northern Pacific	4,181,047	3,805,896	7,986,943
Northwestern Pacific	352,805	96,340	449,145
Oregon Short Line	4,497,336	1,508,614	6,005,950
Oregon-Washington R. R. & Navigation Co.	994,635	534,391	1,529,026
Panhandle & Santa Fe	301,942	579,240	881,182
Pennsylvania Lines West	4,108,784	18,694,478	22,803,202
Pennsylvania Lines East	6,221,997	27,541,578	33,763,575
Pere Marquette Ry.	1,652,356	3,302,865	4,955,221
Philadelphia & Reading	3,055,464	7,257,710	10,313,174
Pittsburgh & Lake Erie	1,002,102	3,008,568	4,010,670
Pittsburgh & Shawmut	18,201	12,076	30,277
Pittsburgh & West Virginia	188,193	73,726	261,919
Pittsburgh, Cincinnati, Chicago & St. Louis	2,369,857	19,974,979	22,344,836
Port Reading	427,890	7,360	435,250
Richmond, Fredericksburg & Potomac	232,202	557,713	789,915
Rutland	469,716	120,941	590,657
St. Joseph & Grand Island	320,241	195,739	515,980
St. Louis, Brownsville & Mexico	23,548	20,830	44,378
St. Louis-San Francisco	2,685,725	1,299,721	3,985,446
St. Louis, San Francisco & Texas	99,000	19,986	118,986
St. Louis Southwestern	1,762,387	1,026,346	2,788,733
St. Louis S. W. Ry. of Texas	443,520	541,070	984,590
San Antonio & Aransas Pass	64,642	81,785	146,427
Seaboard Air Line	1,208,131	1,534,644	2,742,775
Southern Pacific	5,393,006	11,236,818	16,629,824
Southern	21,127,787	3,199,936	24,327,723
Southern Ry. in Mississippi	3,529	2,377	5,906
Spokane, Portland & Seattle	363,033	175,676	538,709
Staten Island Rapid Transit	252,482	42,630	295,112
Tennessee Central	279,831	68,325	348,156
Texas & New Orleans	157,175	62,544	219,719
Texas & Pacific	4,309,228	2,256,610	6,565,838
Toledo & Ohio Central	607,234	247,406	854,640
Toledo, Peoria & Western	.....	5,417	5,417
Toledo, St. Louis & Western	265,654	60,031	325,685
Trinity & Brazos Valley	.....	32,877	32,877
Ulster & Delaware	9,017	.....	9,017
Union Pacific	15,573,160	11,775,224	27,348,384
Vicksburg, Shreveport & Pacific	41,800	158,913	200,713
Virginian	675,183	3,206,606	3,881,789
Wabash	1,851,364	455,730	2,307,094
Washington Southern	.....	62,574	62,574
Western Maryland	2,115,472	663,086	2,778,558
Western Pacific	962,624	1,789,303	2,751,927
Western Ry. of Alabama	288,032	139,365	427,397
West Jersey & Seashore	251,667	526,783	778,450
Wheeling & Lake Erie	202,000	189,350	391,350
Wichita Falls & Northwestern	.....	10,439	10,439
Wichita Valley	.....	58,040	58,040
Yazoo & Mississippi Valley	747,644	975,611	1,723,255
Grand total	$267,237,011	$317,229,011	$584,466,022

$200,000,000 Deficit for Five Months

Complete figures issued by the Railroad Administration covering the operation of the Class I railroads for the month of May show operating revenues amounting to $408,972,229, an increase of 9.8 per cent, operating expenses $350,334,488, an increase of 24.5 per cent, and net operating income $38,839,996, a decrease of 45 per cent. As one-twelfth of the annual rental due the companies amounts to $74,351,326, the net loss to the government for the month was $35,511,330. For the five months ending May 31 the net operating income was $105,656,078 as compared with $371,756,630, which is five-twelfths of the annual rental, so that the deficit for five months is $226,100,552. During this period the net ton miles of freight fell off 14.3 per cent as compared with last year.

Hearings On Railroad Legislation

The House committee on Interstate and Foreign Commerce began hearings on July 15 on the railroad problem, preliminary to the framing of legislation providing for the return of the roads to their owners. While the Esch-Pomerene bill is now the only bill before the committee and therefore in a way forms the basis for the hearings, Chairman Esch of the committee has stated that other bills will doubtless be introduced and that the hearings will cover a broad field of inquiry. Commissioner E. E. Clark of the Interstate Commerce Commission was the first witness to appear before the committee and it was announced that he would be followed by representatives of the United States Chamber of Commerce and probably by S. Davies Warfield, president of the National Association of Owners of Railway Securities. It is expected that Director General Hines will appear before the committee at an early date, while other interests that have proposed plans will also be heard. It is expected that these hearings will continue for about a month.

Organized Draftsmen Ask Increased Pay

At a hearing before the Board of Railroad Wages and Working Conditions, recently representatives of the International Federation of Draftsmen's Unions, affiliated with the American Federation of Labor, and claiming to represent about 2,300 engineers and draftsmen employed on railroads, presented a minimum scale of pay which they asked the board to recommend to Director General Hines. The proposed scale is as follows:

	Minimum Salary per month
Chief draftsman	$300
Leading draftsman or squad man	250
Draftsman, class A	210
Draftsman, class B	175
Draftsman, class C	135
Tracer, class A	125
Tracer, class B	75
Asst. engineer or engineer inspector	250
Asst. inspector, class A	200
Asst. inspector, class B	150
Instrument man	210
Rodman, class A	175
Rodman, class B	150
Tape man, class A	125
Tape man, class B	100*

*Salary to increase $5 every six months as long as he continues to improve.

They also asked for the establishment of a 7½ hour day for five days a week and four hours on Saturday, making 41½ hours per week with no overtime except where absolutely necessary, or at the option of the employee, and time and one half for overtime ordered or made necessary; all traveling and other expenses incurred for railroad business and also expenses attached to moving headquarters; civil service rules to apply regarding vacation, holiday and sick leave; no salary now in existence to be reduced. The federation also presented a proposed classification defining the qualifications for the various positions named in the wage scale. A rodman of class B was defined as one who does not thoroughly understand field work and has little or no experience. A tapeman, class B, was defined as one without college education or experience. The board was also requested to recommend to the director general that he issue a general order requiring all railroads to grant to duly accredited representatives of the federation and their affiliated unions and also to the official representatives of all other organizations of technical engineering and architectural workers the following rights:

1. The right to post notices regarding organization affairs in various offices and places of employment.
2. The right to secure complete lists of technical and architectural workers.
3. The right to enter various places of employment during the lunch period for the purpose of carrying on individual organization work.

It was also requested that the director general issue

a general order that if any reduction in operating expenses in the engineering department must be made, pro rata furloughs without pay be granted in place of discharging forces or reducing the rates of pay and that workers discharged or demoted be reinstated whenever they so desire. A request was also made that machinery be perfected and set in motion for the formation of permanent regulatory committees on each railroad, composed of the various heads and sub-heads of the engineering departments, to prepare budgets of the work and of the forces in each department necessary for carrying on the work during the fiscal year. Is was suggested that representatives of these committees confer with similar representatives of other railroads or with a national committee to be formed to adjust the engineering forces to the work to be done on each railroad so that transfers could be made from roads which had a surplus of men to those which were in need of men.

REGIONAL ORDERS

The Regional Purchasing Committee of the Northwestern region has issued Supplement 18 to circular R. P. C. No. 19, relatively to the application of the standard U. S. R. R. Administration specification for cross ties, with a blue print showing the dimensions of the ties of the various grades which can be accepted and which should be rejected.

The Regional Purchasing Committee of the Northwestern region has issued Supplement 9 to circular R. P. C. circular No. 10 as follows:

"The proper care of empty cement sacks and their prompt return to the manufacturer for credit has resulted in considerable economy on roads that have given this matter attention. The cleaning of sacks before returning them to manufacturers has resulted in saving considerable cement, which has been found entirely satisfactory for use. The practice of some of the cement companies has been to reclaim cement out of sacks returned and sell it again. One road has installed a machine at a cost of $125 for cleaning sacks and reports that during the year 1918 an average of 8,500 sacks were cleaned weekly and a total of 367 barrels of cement were reclaimed, valued at $940.16. The reclaimed cement is inspected by their test department before being used. This road also makes a practice of repairing cement sacks and reports that during the year 1918, 19,475 sacks were repaired at a cost of $229.55, or a little less than 1.2 cents each, and by making these repairs they made a net saving of $374.94.

In addition to the actual saving made in reclaiming cement and repairing sacks they have the advantage of an absolute check against sacks purchased and sacks returned to the manufacturers and are able to locate definitely any loss, and ship sacks back cleaned, repaired and bundled in such shape that they obtain the full credit to which they are entitled.

This is a matter which can very advantageously be followed up.

A Better Understanding With The Foreman

BY W. F. RENCH

THE WRITER holds no brief from any railroad, and also disclaims any thought of currying favor with the track forces. However, along with other men who have occasion to mingle with the foremen he has observed an undercurrent of dissatisfaction in the minds of many of them. Although a material improvement has been effected in their wages, the opinion prevails that it does not measure up to what was expected. This is especially the case in the vicinity of the larger cities where in many such localities the foremen feel that they are not yet receiving a living wage. Since similar dissatisfaction may be found in other departments, the conclusion must be reached that there was no intentional discrimination against the maintenance of way foremen. It is recognized that wage adjustments have not been equally acceptable to all, and it may be inferred that further study is now being given this subject.

In the matter of working conditions, it is believed that there is more or less objection on the part of section foremen to being considered subject to call at all times, without definite compensation for such service. It is felt that the very nature of their work entitles them to complete freedom from duty through reasonable intervals. All must grant that the duties of the foreman are of the broadest scope and exacting in character. He must not only direct work, but he must also conceive, plan and execute it. He must frequently engage in work personally in order that an operation may be carried on smoothly and without any lost motion. While his day is nominally of eight hours, his actual work extends beyond that period, and for this extra service he is allowed no pay. In some places he is required to spend several hours of Sunday inspecting his section, and while he is compensated for this service, it has the effect of nullifying the benefit that would otherwise accrue from complete relaxation on one day of the seven.

The means to overcome the prevailing discontent well may engage the attention of the roads now; its ultimate determination cannot be avoided. When the ranks of the proven foremen shall bave been further depleted, who is there left to fill up the gaps? Not the men of foreign nationality certainly, although there are exceptions of course. While these men make excellent foremen where their effort is minutely directed, they have not, as a class, shown the capacity for organization which the situation requires. It is true that a considerable proportion of the section foremen now are men of foreign birth, but it is likewise a patent fact that such men need closer attention on the part of the superior. Also it is probable that on many occasions these men seek and receive detailed advice from their American associates. An early effort has been put forth in the past by a number of the roads to meet the situation by instructing their foreign employees in the language, as well as in the methods of performing work. The Italian-English course was for a time a live subject on one road, but it has not been pursued for two years. It seems opportune to suggest that such instruction be resumed at an early day.

From the standpoint of the road, the practical solution appears to be to make every reasonable effort to hold the present capable foremen, even though other increases in wages may be necessary, and to improve further the working conditions by allowing the foremen a certain measure of relief from subsequent calls.

As a corollary to this, it is also desirable to draw into the service younger men, who may in time be trained to succeed to the position of foreman. It will, of course, be necessary to make the work attractive to them, so that they also will stay in the service. It is well known that many sons of track foremen, who would develop into capable trackmen, are lost to the maintenance of way department, and often to the road, altogether, because sufficient encouragement was not advanced. In this connection, it is essential that the potential foreman shall round out his apprenticeship on the track. A foreman cannot teach a laborer how to handle tools or perform work unless he has himself learned it by practice. The increasing scope of the foreman's responsibility makes it imperative that he shall have mastered the job from the ground up. In view of the manifold duties he must perform, his position should be recognized as something higher than that of a more or less expert trackman. It is believed that a better feeling would result if these men were regarded as minor officials of the company they serve.

The matter of relieving the foreman from being continually on duty is one that can perhaps best be met by each division for itself. Already in several places the foremen have sought and obtained a virtual release from duty after the working day is done. The need of holding some responsible person always available for emergency is met by having an assistant foreman delegated to this service. It might be made the rule generally to summon the assistant for ordinary trouble. In the event the trouble were large, the foreman would practically always be available when needed. There seems to be no question that compensation should be given for remaining subject to call. If this were arranged probably many foremen would be content to perform such duty.

The attitude assumed by his superiors toward the foreman will do much to foster or allay the unrest now prevailing. A certain degree of cordiality well may mark the relation betwen supervisor and foreman. The former need fear no slackening of the foreman's effort by reason of such consideration. It is possible in any locality to find some particularly efficient foreman whose career of extra effort dates from some individual courtesy shown him by one of the higher officers. The patience of the foreman has been sorely tried the past two years by maintenance conditions, and these are likely to remain a source of anxiety for some time to come. The supervisor feels the annoyance of the inefficiency of labor less directly than the foreman, and can help the situation materially by frequent and kindly discussion of the matter in personal interview.

The manner in which discipline is imposed, especially for minor infractions of the rules, plays an important part in the foreman's relation to the service. It is of course not proper that discipline should be suspended in any case, for it is well known that failure to enforce one rule tends to create a disregard for other rules. The point is that the utmost care should be exercised, to the end that discipline shall not be laid undeservedly, or with undue severity. It seems only right that men of whom extra service is required, which often is of the most exacting kind, should be given every reasonable consideration. Foremen as a class are somewhat sensitive, and it is only human to balance the exhausting effort of some emergency which may have lasted for days at a stretch, against a punishment for what after all was an error of oversight rather than intention.

Probably the greatest incentive of all will be a definite progression in employment, by which the foreman will know that his efforts are raising him even higher in his vocation. This progress obtains in nearly every branch of railroad work, and in most lines of private industry. Only by a living wage and satisfactory working conditions, by just and even generous treatment, and by a definite prospect of advancement, can foremen be induced to stick to the job and continue their loyal efforts to save in maintenance by increasing the efficiency of their work.

THE MATERIAL MARKET

THE PERIOD of uncertainty in the material market seems to be coming to a definite conclusion. With the closing of considerable business in nearly all lines the manufacturers are being assured a steady outlet for their productions. As a result, prices are holding steady and the quotations given below for iron and steel products remain unchanged.

	Prices in Cents Per Pound	
	Pittsburgh	Chicago
Track spikes	3.35	3.62
Track bolts	4.35	4.62
Angle bars	2.75	2.75
Tie plates, steel	2.75	2.75
Tie plates, iron	2.75	2.75
Wire nails	3.25	....
Barb wire, galvanized	4.10	....
Cast iron pipe, 6 in. or larger, per ton	....	51.80
Plates	2.65	2.92
Shapes	2.45	2.72
Bars (steel)	2.35	2.62

One indication of the steadiness of market conditions is the tendency toward advances in the prices of scrap, notwithstanding the slow movement of this material, and the fact that considerable amounts are being offered. At Chicago alone the railroads have offered over 7,000 tons of scrap. Following are current quotations in the scrap market for items of interest in the maintenance of way field:

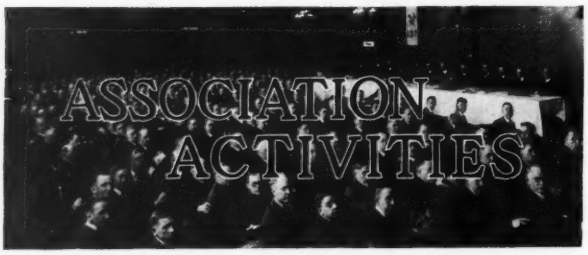
	Pittsburgh	Chicago	St. Louis
Rail, relayers		$35.00-$45.00	
Rail, rerolling	$19.00-$20.00	23.50- 24.40	$24.00-$24.50
Rail, less than 3 ft. long		21.50- 22.00	21.50- 22.00
Frog and switch cut apart		18.50- 19.50	19.50- 20.00
No. 1 railroad wrought	19.50- 20.00	17.50- 18.50	18.50- 19.00
Steel angle bars		18.00- 18.50	17.50- 18.00

One movement now on foot which arouses no little interest and promises to have a profound effect on the iron and steel market concerns the effort being made to introduce an f. o. b. mill base for all products, in place of the Pittsburgh base now in vogue on many items. Thus an order for track bolts now placed with a Chicago manufacturer is quoted f. o. b. Chicago at the Pittsburgh price, plus the freight from Pittsburgh to Chicago. The Western Association of Rolled Steel Consumers is objecting to this and the matter is now in the hands of the Federal Trade Commission.

The prices of Portland cement have remained stationary during the month. A slight adjustment was made in the price at St. Paul, which is now $2.25 instead of $2.30. Current quotations for cement per barrel at eight cities in the middle west are given in the table below, these prices being for carload lots of cement in sacks, but not including the charge made for the package, which is 60c per barrel for cloth sacks and 25c for paper bags (per barrel):

Chicago	$2.00	Cleveland	$2.32
Pittsburgh	2.05	Indianapolis	2.27
Milwaukee	2.11	Duluth	2.10
St. Paul	2.25	Toledo	2.12

There is no indication of a break in the price of lumber and there have been some further advances. There has been, however, some tendency toward a reduction in the demand, which is affected perhaps as much by labor unrest in the building trades as by any other influence.



IN SPITE OF the handicaps under which officers in the maintenance of way department are laboring at the present time, the members of the different associations in this branch of railway service are working actively in their respective associations as indicated below.

AMERICAN RAILWAY ENGINEERING ASSOCIATION

The proceedings of the last annual convention which was held in Chicago in March are now in the hands of the printer and it is expected that they will be ready for distribution within a month.

Approximately 15 members of the Committee on Electricity started from Chicago on July 8 for a trip of inspection over the electrified lines of the Butte, Anaconda & Pacific and the Chicago, Milwaukee & St. Paul in Montana, returning on July 16. In addition to studying the operation of both freight and passenger trains electrically, the party visited power plants at Great Falls and the repair shops of the Chicago, Milwaukee & St. Paul at Deer Lodge.

The Committee on Conservation of Natural Resources will meet at Marquette, Mich., August 7, and will spend two days on a special train provided by the Lake Superior & Ishpeming and the Munising, Marquette & Southeastern railways, traveling over those portions of the lines of these roads subject to devastation by forest fires in order that they may study the problems of fire control and prevention at first hand and make proper recommendations, in accordance with a request referred to this committee by the American Railroad Association.

THE ROADMASTERS' ASSOCIATION

The members of the Executive committee of the Roadmasters' and Maintenance of Way Association met with the chairmen of the committees of that organization at the Hollenden hotel, Cleveland, Ohio, on Saturday, July 12, to consider the reports which will be presented at the annual convention in Chicago, on September 16 to 18 and to formulate plans for that meeting. The reports of the committees were considered in detail, after which they were referred back to the chairmen for final revision.

It was decided that the convention should extend for three full days with a business session on Tuesday evening and the annual dinner on Wednesday evening. In addition to the committee reports, arrangements were made for the presentation of papers on different phases of the labor and material problem as they affect the track department. The Railroad Administration has expressed its approval of this convention and instructions will be sent to all federal managers to arrange for as many of their roadmasters to attend as can be spared from their work.

The members of the Executive committee of the Track Supply Association met at the same hotel on the same day to perfect plans for its exhibit which will be held in conjunction with the convention of the Roadmasters' Association. The number of applications for space which had been received by July 28 was 47, which is larger than that at the same time in any previous year and the present indications are that the number of firms desiring to exhibit will exceed the number of spaces available. Owing to the fact that the Railway Signal Association will hold its annual convention at the Congress Hotel, Chicago, during the same week, it was decided that the exhibit of the Track Supply Association should be held intact until Friday evening to give the members of the Signal Association an opportunity to visit it.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION

A meeting of the Executive committee will be called in the near future to complete the arrangements for the annual convention which will be held at the Hotel Statler, Cleveland, Ohio, on October 21-23 inclusive. Work on a number of the reports which will be presented at this meeting is now approaching completion, while arrangements are also being made for the presentation of several special papers. It has been tentatively planned that the program will include a special feature on Tuesday evening illustrating work of interest to bridge and building men, while the annual dinner will be held on Wednesday evening.

The Bridge and Building Supply Men's organization held a meeting at the office of M. J. Trees, secretary at Chicago, on July 23, at which plans were made for the exhibit which will be presented at Cleveland in connection with the convention of the Bridge and Building association.

AMERICAN WOOD PRESERVERS' ASSOCIATION

The proceedings of the Fifteenth annual convention which was held in St. Louis in January are now in the hands of the printer and it is expected that they will be ready for distribution within a few days.

Members of the Service Records committee inspected early installations of treated ties and screw spikes on the Lackawanna on July 9 and the following day examined treated timber in jetties of the Central Railroad of New Jersey near Seabright, N. J.

THE MASTER PAINTERS

Members of the Maintenance of Way Master Painters' Association are now rounding out their work on the assigned subjects for the annual convention which will be held at St. Louis, Oct. 21-23, inclusive. The following is the assignment of subjects for reports by committees and personal papers by members for presentation at this convention. It is expected, however, that the program as finally drawn will include a number of papers in addition to those in this list.

How to Secure Good Results Under Extreme Temperatures, F. C. Riebolt, C. M. & St. P., Milwaukee, Wis., and Wm. Dunstan, D. M. & N., Duluth, Minn.

What Tools and Equipment Does a Paint Gang Require? H. B. Wilson, B. & L. E., Greenville, Pa., Vincent Staub, Penn. Lines, Cleveland, Ohio, and J. C. Johnson, C. & N. W., Elsworth, Ia.

Housing and Boarding, H. C. Hopkins, G. C. & S. F., Temple, Tex., Wm. S. Hopkins, G. C. & S. F., Cleburne, Tex., and W. I. French, N. Y. O. & W., Middletown, N. Y.

Economy in Handling Tools and Material, C. W. Hellabaugh, Penn. Lines, Rosemont, Ohio, Wm. Dunstan, D. M. & N., Duluth, Minn., and M. F. Ebel, B. & O., Hamilton, Ohio.

Possibilities of Arranging Work so to Keep Men Employed Throughout the Year, Harry Jones, C. C. C. & St. L., Wabash, Ind.

Report on the Results Secured with Spray Painting in Economy of Work and Permanence of Coating, H. S. Bird, P & R., Philadelptia, Pa.

The Grainer of the Past and Present, Martin Jane, D. & H., Albany, N. Y.

GENERAL NEWS DEPARTMENT

The Pennsylvania Twenty-five Hour Express between New York and St. Louis, which was discontinued last year, is to be restored in the near future. A charge of $3 will be made as extra fare on this train.

The United States Senate recently adopted a resolution proposed by Senator Newberry calling on the director general for a statement regarding the issuance of Railroad Administration annual passes good over all lines. The director reported that the total all-line railroad passes numbered 3,995 and all-line Pullman passes 1,903 on July 1.

The sundry civil bill, as finally passed by Congress on July 2, includes the proposed appropriation of $2,500,000 for the Interstate Commerce Commission's valuation work and $2,038,029 for the Alaska railroad. This was the amount adopted by the House, although the Senate made an effort to increase it to $12,000,000.

S. M. Felton, president of the Chicago Great Western Railway Company, has been given the title of commander of the Legion of Honor by the French Government in recognition of his work as director general of military railways. Mr. Felton has also been decorated by the United States Government with the distinguished service medal for his efficiency in connection with the same work.

"Two Popular Methods of Getting Killed," is the title of the latest safety-first pamphlet issued by George Bradshaw, safety supervisor of the Pere Marquette and other Michigan roads under Federal Manager F. H. Alfred. The two methods are the highway crossing method, and walking along railroad tracks. Interesting comparisons are drawn between these American methods of getting killed and ancient methods of accomplishing the same purpose; and the ancients are believed to have had the better way.

The Pennsylvania Railroad has installed a push button and bells connected by an electric circuit for the use of enginemen in calling in flagmen at Tyrone, Pa. The push button is located on the station platform while the bells are located 1,000 and 1,600 ft. down the tracks from that point. This innovation was adopted to eliminate a large amount of whistling which would otherwise be necessary at this point because of the many trains that stop at this station, and the necessity for flagging, as the station itself is located on a curve.

A new record for fast runs with a heavy train was made recently by eastbound express train No. 4 of the New York Central, Western Lines, on Sunday, May 14. This train covered the distance from Elkhart, Ind., to Toledo, Ohio, 133.01 miles, in one hour, 54 minutes, or at the rate of 70 miles an hour. The distance from Millersburg, Ind., 18 miles east of Elkhart, to Nasby Tower, about four miles west of Toledo, a distance of 111.31 miles, was traversed in one hour, 27 minutes, equal to 76.76 miles an hour. The train consisted of seven steel cars, weighing about 940,900 lbs. and engine, No. 4853, weighing about 250 tons with its tender.

A bill has been introduced in both houses in Congress proposing the creation of a Department of Public Works, in which will be concentrated all engineering and architectural activities of the government. This bill has the backing of the engineering societies of the country. It is proposed to change the name of the Department of the Interior to the Department of Public Works and to transfer to this department all engineering activities now handled by other departments, while transferring from the Department of the Interior activities of other than an engineering character. Among the activities which it is proposed to transfer to the new department are the supervising architect's office, the Construction Division of the U. S. Army, River and Harbor Improvements, the Mississippi River Commission, the Coast and Geodetic Survey, the Bureau of Standards, the Bureau of Public Roads and the Forest Service. Among the activities which will be transferred to other departments are the Patent Office and the bureaus of Pensions, Education and Indian Affairs. The decision to urge the proposed department was reached at a conference held in Chicago in April and attended by representatives of over 75 engineering organizations, representing an aggregate membership of over 100,000 engineers.

The first six months of 1919 witnessed the greatest return troop movement in this country, during which period the total number of men moved on special and regular trains aggregated 4,276,949. Including the number of officers and enlisted men making railroad trips on furloughs, and men who traveled to their homes from the demobilization camps, it is estimated that the total movements of military passengers aggregated 7,250,000.

Fourteen port and interior terminals are included in the 581 major projects, involving an expenditure of more than $1,200,000,000, handled by the Construction division of the United States Army during the 18 months this country was at war. These terminals were designed to afford storage for government supplies in order to utilize rail and water transportation most efficiently. These port terminals are located at Boston, Mass.; Brooklyn, N. Y.; Port Newark, N. J.; Philadelphia, Pa.; Norfolk, Va.; Charleston, S. C.; and New Orleans, La., while interior warehouses are built at Chicago; Columbus, Ohio; Jefferson, Ind.; Pittsburgh, Pa,; New Cumberland, Pa.; Schenectady, N. Y.; and St. Louis, Mo.

Complete reports of "No Accident Week" in the Northwestern region, June 22 to 28, illustrate the practical results of this campaign in several interesting ways. Of the 62 roads competing in the campaign, 50, or 79.36 per cent, had clear records. A reduction in accidents was made from 481 (of which 6 were fatal) in the week of June 22 to 28, 1918, to 119 (of which 5 were fatal) in the corresponding week this year; a decrease of 362 accidents, or 75.46 per cent. Based on the number of accidents per hundred men employed, a reduction of 77.78 per cent was accomplished. Based on the figures for 1919 there was one accident for every 2,304 men employed in the region; in 1918 one accident for every 569 men employed, a decrease of 1,736, or 305.5 per cent. There was one accident to 444 miles of road operated in 1919, and one accident to 110 miles operated in 1918, or a decrease of 304.2 per cent. The road employing the largest number of men which operated with a clear record was the Chicago Great Western. The road having the largest operated mileage and making a clear record was the Oregon-Washington Railroad & Navigation. This road also had the largest number of accidents last year. The Chicago, St. Paul, Minneapolis & Omaha made the largest reduction in accidents based on 100 men employed.

AMERICAN CONCRETE INSTITUTE ANNUAL CONVENTION

The annual convention of the American Concrete Institute was held in Atlantic City, N. J., on June 27 and 28, 1918, with headquarters at the Hotel Traymore. The first morning session was devoted to the presentation of committee reports on plain and reinforced concrete sewers and the treatment of concrete surfaces. All the other sessions were held jointly with the American Society for Testing Materials, at which papers and reports on ceramics, lime, road materials, concrete and gypsum were presented. On Saturday a paper by A. C. Irwin on Concrete Railroad Track was presented, which is abstracted elsewhere in this issue. A report of the committee on Reinforced Concrete Highway Bridges and Culverts, while devoted principally to small highway culverts, developed some very interesting information as to types and designs of highway bridges spanning over railway tracks.

PERSONAL MENTION

GENERAL

R. D. Starbuck, assistant to the federal manager of the New York Central and formerly in the engineering department of the Michigan Central, has been appointed assistant regional director of the Eastern region, with headquarters at New York.

Col. James A. McCrea, formerly general manager of the Long Island Railroad, for many years in the engineering and maintenance of way department of the Pennsylvania Railroad, who recently returned from France, has been elected a vice-president of the Bankers' Trust Company, New York.

David Kirk Orr, assistant chief engineer of the Monongahela Railroad, has been appointed superintendent of that road, with headquarters at Brownsville, Pa. Mr. Orr was born November 24, 1865, in Allegheny City, Pa. He was educated in the Western University of Pennsylvania and Geneva College. He began railway work on June 10, 1889, with the Norfolk & Western as a topographer's assistant, remaining in that position until September, 1890, when he went to the Pittsburgh & Lake Erie as transitman. He later served as assistant engineer on that road. In August, 1903, he went to the Monongahela Railroad as engineer, and subequently served as chief engineer until August, 1918, when an arrangement for the management of the Monongahela jointly with the Pittsburgh & Lake Erie resulted in extending the authority of J. A. Atwood, chief engineer of the last named road, also over the Monongahela, Mr. Orr being made assistant chief engineer.

ENGINEERING

Lieut.-Col. Blair Ripley, who returned to Canada about two months ago and resumed his position as engineer on construction with the Canadian Pacific, has recently received further recognition of the splendid services he rendered with the Canadian Railway troops in France by having bestowed upon him the title, Commander of the British Empire.

Carl B. Andrews, for the past ten years chief engineer of the Oahu Railway & Land Company of Honolulu, Hawaii, has resigned this position to take up the work of planning and constructing a railway system of the Pampanga Sugar Development Company of Manila, Philippine Islands. He left Honolulu on July 6 for Manila to take up this work, which is expected to require about a year and a half for completion.

W. G. Tinney, who has been appointed division engineer on the Union Pacific, with headquarters at Denver, Colo., as noted in last month's issue, was born at Fostoria, Ohio, in 1879. He attended the Ohio State University and in 1904 entered railway service with the Illinois Central. He remained with this road for five years, being employed on all classes of railroad construction. In 1909 he entered the service of the Union Pacific as an engineer on construction work, and has remained in the continuous employ of that road until his recent appointment to the position of division engineer.

T. J. Bivens, assistant engineer in the maintenance of way department of the Union Pacific, with headquarters at Omaha, Neb., has been promoted to assistant division engineer, with the same headquarters. Mr. Bivens was born on February 26, 1875, at Creston, Iowa. He entered railway service on April 10, 1899, as rodman on the Union Pacific. From 1902 to 1904 he served as assistant in the maintenance of way and construction departments, and from 1904 to 1907 he was office engineer at Denver and Cheyenne. In 1907 he was assistant engineer in permanent bridge work, being transferred in 1908 to Ogden, Utah, as office engineer. In 1909 he was general foreman of second track construction, while in 1910 and 1911 he was division engineer of the Bingham & Garfield. In 1912 he served again as assistant engineer of the Union Pacific at Denver, Colo., going to the Moffat Road in 1913 as general foreman. He returned to the Union Pacific in 1914 as office engineer at Cheyenne, Wyo., being transferred to Kansas City, Mo., in 1916.. In October, 1918, he became assistant engineer in the maintenance of way department, which position he held until his recent appointment.

J. H. Minton, senior assistant engineer on the Pennsylvania Western Lines, with headquarters at Pittsburgh, Pa., has resigned to accept a position with the United States Steel Corporation at Pittsburgh. The field work formerly handled by Mr. Minton has been placed in charge of **T. M. Bole,** assistant engineer, with headquarters at Pittsburgh, and the office details and preparation of plans and specifications in connection with new construction work, formerly handled by Mr. Minton, has been taken over by **L. P. Struble,** assistant engineer, with headquarters at Pittsburgh.

Louis Yager, engineer maintenance of way of the Northern Pacific, with headquarters at St. Paul, Minn., has been promoted to chief maintenance of way engineer of the United States Railroad Administration, with headquarters at Washington, D. C. He was born at Germantown, Wis., in 1877, and received his education at the University of Minnesota, from which he graduated in 1900. He had previously been in railway service in 1899 as a chainman on the Minneapolis & St. Louis and after graduating entered the employ of the Northern Pacific as a rodman. He later became inspector on building contracts and assistant engineer on maintenance and construction. In March, 1902, he was promoted to supervisor of bridges and buildings, with headquarters at Minneapolis, Minn., retaining this position until February, 1907, when he entered the engineering department as assistant engineer in charge of the reconstruction of the drawbridges in Duluth, Minn., and the construction of new lines in Montana. In March, 1910, he was promoted to division engineer in charge of the lines east of the Missouri river with headquarters at St. Paul. He remained in this position for seven years, at the end of which time he was promoted to engineer maintenance of way, the position he held prior to his recent appointment.

Louis Yager

J. C. Beckwith, engineer of construction of the Canadian Government Railways, with headquarters at Moncton, N. B., has been promoted to district engineer of the Levis, Edmundton and St. Lawrence divisions of that road, with headquarters at Quebec, Que. Mr. Beckwith was born at Fredericton, N. B., on August 1, 1875, and entered railway service in June, 1898, as a rodman and draftsman on the Columbia & Western railway. In 1900 he became a draftsman on the Canadian Pacific in British Columbia and in Ontario, and the following year was transferred to Winnipeg in the same capacity. From 1902 to 1903 he was transitman and leveller, with the same headquarters, and in 1903 was promoted to resident engineer. From 1905 to 1907 he was assistant engineer in the construction department of the Eastern Lines, with headquarters at Montreal. In 1907 he left that road and entered the employ of the New Brunswick Southern as engineer in charge, with headquarters at St. John, N. B. In 1909 he became division engineer of the New Canadian Company at Port Davis, Que., and later in that year he became an assistant engineer on the Canadian Pacific in the construction department of the Western Lines, with headquarters at Winnipeg. In 1913 he was transferred to the construction department of the Eastern Lines, and later became assistant engineer of the Canadian Government rail-

ways, with headquarters at Moncton, N. B. On April 1, 1914, he was promoted to engineer of construction, which position he held until his recent appointment as district engineer.

Bernard Blum, district engineer on the Northern Pacific, with headquarters at St. Paul, Minn., has been promoted to engineer of maintenance of way of the Lines East of Paradise, Mont., with the same headquarters, succeeding **Louis Yager,** who has taken a position in the office of the assistant director, Division of Operation, as noted elsewhere. **J. T. Derrig** has been appointed district engineer, lines east of Mandan, with headquarters at St. Paul, in place of Mr. Blum. Mr. Blum was born on February 12, 1883, at Chicago. He received his education at the Massachusetts Institute of Technology, graduating in the class of 1904. He entered railway service in 1905 with the Chicago Junction, where he remained until March, 1907, at which time he joined the construction department of the Northern Pacific as an assistant engineer in Montana. In December, 1909, he was promoted to assistant division engineer at Livingston, Mont., and in October of the following year he became road master at Duluth, Minn. He next acted in the capacity of assistant district engineer with headquarters at St. Paul, Minn., which position he held until January 1, 1917, when he was promoted to district engineer of the lines east of Mandan, N. D., with headquarters at St. Paul, Minn., in which capacity he served until his recent promotion as engineer maintenance of way.

Bernard Blum

TRACK

James Kennedy has been appointed roadmaster of the First district on the Denver & Rio Grande, with headquarters at Colorado Springs, Colo., succeeding **S. F. Porter.**

E. C. Finnessy has been appointed roadmaster of the Second District of the Denver & Rio Grande, with headquarters at Canon City, Colo., succeeding **C. Johnson,** transferred.

W. M. Kilgore has been appointed acting roadmaster on the Julesburg district, Colorado division, of the Union Pacific, with headquarters at Sterling, Colo., in place of **C. F. Hideman,** who has been granted a leave of absence.

A. A. Snyder has been appointed acting supervisor of track of the Fourth district of the Montreal division of the Grand Trunk, with headquarters at Montreal, succeeding **W. Bibby,** assigned to other duties.

Corbet W. Coil has been appointed roadmaster on the Dakota division of the Northern Pacific, with headquarters at Mandan, N. D., effective July 1, succeeding **William G. Ashworth,** promoted to main line roadmaster on that division, with headquarters at Jamestown, N. D.

H. A. Halvorson, who has returned from military service abroad, has resumed his position as roadmaster on the Chicago & North Western, with headquarters at Eagle Grove, Ia., succeeding **W. J. McDermott,** who recently retired because of ill health.

S. O. Lund, assistant division roadmaster on the Sioux City division of the Great Northern, with headquarters at Sioux City, Iowa, has been promoted to division roadmaster of that division, succeeding **P. F. Connelly,** retired and pensioned. **F. C. Hanneman,** division roadmaster of the Spokane division, with headquarters at Spokane, Wash., has been transferred to the Marcus division, with headquarters at Marcus, Wash., succeeding **Nels Johnson,** transferred to the Spokane division. **D. Deneen,** roadmaster at Great Falls, has been transferred to the Havre division, with the same headquarters, in place of **D. F. Mulkern,** transferred to Cut Bank, Mont. Mr. Mulkern assumes the duties of **James Sullivan, Jr.,** who has been transferred to the Kalispell division, with headquarters at Rexford, Mont., succeeding **Nels Hovind,** transferred.

C. C. Johnson, roadmaster on the Canadian National Railways, with headquarters at Campbellton, N. B., has been transferred to the Mulgrave subdivision, with headquarters at New Glasgow, N. S., succeeding **H. I. Gray,** who has been transferred to the Bridgewater division of the Halifax & Southwestern. **William Sidwell** has been appointed roadmaster of the Dartmouth subdivision of the Canadian National Railways, with headquarters at Dartmouth, N. S., in place of **James Myers.**

PURCHASING AND STORES

Albert C. Mann, purchasing agent of the Illinois Central, with headquarters at Chicago, has resigned to become vice-president of the American International Steel Corporation, with headquarters at New York.

H. G. Davis, acting storekeeper on the Toledo, St. Louis & Western, with headquarters at Frankfort, Ind., has been promoted to general stores agent, with the same headquarters, in charge of the inspection of ties and other forest products. **C. N. Thacker** will succeed Mr. Davis as storekeeper, with headquarters at Frankfort.

W. C. Bower, purchasing agent of the New York Central, with headquarters at New York, has had his jurisdiction extended over the Lines West of Buffalo, succeeding **G. R. Ingersoll,** who has resigned to engage in other business. **C. C. Warne,** assistant purchasing agent, with headquarters at New York, has been appointed first assistant purchasing agent and **W. P. Winter** has been appointed assistant purchasing agent, with office at Cleveland, Ohio.

OBITUARY

John Bentley Sheldon, bridge and building supervisor of the Providence division of the New York, New Haven & Hartford, with headquarters at Providence, R. I., died at his summer home at West Kingston, R. I., on July 2. Mr. Sheldon was born at South Kingston, R. I., on September 24, 1857. He entered the employ of the New York & New England Railroad in the bridge department in 1881, and after three years service there he became bridge foreman on the New York, Providence & Boston, now part of the New York, New Haven & Hartford. In 1888, he was appointed bridge supervisor of the Worcester division of the New Haven and continued in that position until the time of his death. He was active in the work of the American Railway Bridge and Building Association, of which he was president in 1905.

The Canadian National is calling for tenders for 6,500,000 ties, of which 3,525,000 are for use on the Western Lines, 1,400,000 for the Eastern Lines, 1,375,000 for the Central Lines and 200,000 for the Halifax & South Western (Nova Scotia). These ties are for delivery between October 1, 1919, and October 1, 1920.

The exports of rails in May, amounting to 76,134 tons, of a value of $4,902,970, were considerably greater than those of April, but not as large as in February. The exports of railway spikes, amounting to $437,392, and those of frogs, switches, etc., were, however considerably in excess of those of any previous month so far this year. Of the rails, large shipments were made to Japan, France, China, Belgium and British South Africa. Over half the spikes and switches, frogs, etc., were consigned to France, with a total of $290,972 for spikes, $890,227 for rails and $1,094,016 for switches, frogs, splice bars, etc. Shipments to the rest of the world were pretty well distributed.

CONSTRUCTION NEWS

The Chicago & North Western contemplates the construction of an addition of 78 storage bins to its grain elevator at South Chicago, which will cost approximately $1,000,000 and will increase the capacity of the elevator by 3,000,000 bu. Contracts for the work have not been let.

The Louisiana Railroad & Navigation Company will soon begin the rebuilding of the car and repair shops at Shreveport, La., which were destroyed by fire, with an estimated loss of $100,000. The construction of the buildings will be done by the company's bridge and building forces.

The Philadelphia & Reading has given a contract to Charles C. Pace for building a new powerhouse for the enginehouse which was recently built in the yard at Reading, Pa. The new building will be a brick structure on concrete foundation, 38 ft. wide and 50 ft. long.

The Seaboard Air Line has awarded a contract to C. E. Hillyer, Jacksonville, Fla., for the reconstruction of a portion of the Hutchinson Island terminal facilities of this road near Savannah, Ga., which were destroyed by fire on February 14. The work consists of the restoration of sheds, docks, wharves and other facilities.

A road in Texas will be built connecting the Texas Central with the St. Louis-San Francisco in Erath County, Tex., through Breckenridge, Stevens County, to Ranger, Eastland County, under the auspices of Frank Kell, president of the Clinton & Oklahoma Western, J. A. Kemp of Wichita Falls, Tex., and associates. The new road will be approximately 150 miles long.

The Canadian National Railways recently awarded contracts for grading as follows: One additional main line track between Truro, N. S., and Belmont, about 7.57 miles, to the Bate, McMahon Company, Ltd., Ottawa; one additional main line track between Springhill Junction and Maccan, about 9.13 miles, to A. Wheaton & Dominion Construction Company, Ltd., Halifax; about 3.35 miles of double track at Moncton to A. Wheaton & Dominion Construction Company, Ltd.; a double-track diversion from mile 108.21 to mile 112.91 between Ste. Rosalie and Charlotte, about 4.7 miles, to Waters, Doheny & Co., Montreal, and for the substructure for a two 150-ft. double-track span bridge over Tantramar river at mile 85.6 on the Truro subdivision.

The Edward Rutledge Timber Company Railroad, Couer D'Alene, Ida., will build an eight-mile railroad with branches from Clarkia, Ida., to its large timber holdings in that state. The new road will be extended gradually through its timber property.

The Northern Pacific has awarded a contract to McManis & Tarnoski, St. Paul, Minn., for the construction of a new passenger depot at Brainard, Minn., to replace the one destroyed by fire. The building will be 40 ft. by 162 ft., two stories high and basement, with a 40 by 30 ft. covered platform at each end. The total cost including track changes will be approximately $100,000. Work was started in June.

The Pennsylvania Lines have resumed work on the extension into Detroit, Mich., after a delay of more than a year, due to war conditions. The first undertaking is the construction of the main belt line from a point on the Pere Marquette, just north of Michigan avenue, to the Ford Motor Company plant, a distance of about six miles. Three hundred acres of land has been acquired west of the River Rouge near Oakwood, Mich., for a classification yard.

The Texas & Pacific will reconstruct machine shop facilities at Marshall, Tex., to replace those destroyed by fire during 1918. The work will consist of extensions to the present buildings and boiler shops, one part of which will be set aside for machine shop purposes. The cost of the building work proper is estimated at $250,000, in addition to which new and improved machinery will be installed.

FOREIGN RAILWAY NEWS

The proposed railway project from Algericas, Spain, to the French frontier has been abandoned by the Spanish Government. This railway was intended to form a link in the proposed Paris-Dakar line.

M. Claveille, French minister of transportation, has made a report to President Poincare, which shows that since the signing of the armistice 564 miles of double-track railway lines and 567 miles of single-track lines have been restored on the Northern and Eastern railways.

Holland is said to be considering the purchase of American steel rails on a larger scale during the next few years. They will be mainly used for the extension of the railways in the Dutch Indies, with a view to benefiting the sugar industry. The annual purchases will probably amount to 50,000 tons.

More than 50 German and American locomotives, it is reported, will shortly be sent from France through Switzerland to Roumania and Poland to supply the urgent need for engines in those countries. Roumanian enginemen have already arrived in France to take charge of some of these locomotives.

The Government of Jamaica is reported as arranging to have a survey made of the water power of the large rivers to see if electrification of the railways is feasible. The heavy cost of coal and the necessity of a considerable railroad extension owing to an expected agricultural development explain the proposed change.

Glasgow, Scotland, it is reported, has placed an order for 5,000 tons of tramway rails with the United States Steel Products Company, which has promised an earlier delivery than can be guaranteed by Scottish or English firms. The price quoted is £17 9s. per ton, as compared with £19 1s. 3d., the lowest British offer.

The railway from Cape Town, South Africa, to Katanga is to be extended northwards from Bukama to Kibombo along the Lualaba (Upper Congo), and the construction of the Congo-Nile Railway is expected to start shortly. The extension of the railway from Bukama is intended to facilitate traffic between Katanga and the more northern regions of the Belgian Congo.

The Japanese are said to be exploiting on a large scale the ores which they have discovered in Korea, and to be making extensions of their industries to handle this new source of supply. Ore concessions in China will further increase the Japanese raw material supply. It is predicted that Japan will soon be independent of outside sources of supply and in another ten years' time will be exporting cheap steel to the Pacific markets.

The train ferry service that was worked out by the British military authorities between Richborough, England, and Calais, France, is going to be followed by a permanent commercial service, if plans of French business men work out as hoped. An intensive study has already been made of the opportunities for developing ferries, both from the engineering and commercial points of view, the Societe Centrale bringing together a consulting council for the purpose.

The Swedish Railway Board, says an article quoted in Commerce Reports, has just submitted a report relative to the establishment of daily connections between Sweden and England, by a steam-ferry line between Goteborg and a harbor on the Humber, either Hull or Immingham. The board decided upon the steam ferries, as a ferry line to the Humber can count on a higher income, as well as lower costs of operation, than an ordinary boat line, if the vessels are of equal size.

The Belgian Government has introduced into the chamber a bill placing the management of the railways in the hands of a self-governing body to be known as the National Bel-

gian Railways Administration. Under this bill the chambers will supervise the activities of the administration and the parliamentary responsibility of the minister of railways will remain unaffected. The right of all members of the personnel to unite for the defense of their interests is explicitly recognized, and both the lower employees and the members of the council of administration will have an interest in the results of the working of the railways.

The government railways of Japan have decided to cut a submarine tunnel under the Shimonoseki strait. It will be started this year and it is planned to complete it in 1928. At present the railway systems in Honshu and Kyushu are connected by ferryboats, but when the tunnel is completed the connection of the two systems will be much improved. A more detailed statement of this project appeared in the *Railway Maintenance Engineer* for May, 1919, page 183.

The Rio de Janeiro state government has granted concessions for the construction of a steam railroad of meter gage from the port of Manzuinhos, in the district of Sao Joao de Barra, to Porte de Itabapoana, district of Campos. The length is approximately 52 kilometers. Construction must be begun in two years after the promulgation of the decrees, and completed in two more.

The Mexican government has just approved plans for the construction of a belt railway around the city of Mexico. It is stated that the survey for the proposed road has been made and that the route circles the Valley of Mexico, it being one purpose of the line to afford connection with all of the principal suburban towns and many outlying industrial plants. The government authorities all believe that the road will prove of great military service in the matter of affording means for the quick and easy movement of troops from point to point around the capital. The president of the republic has just authorized the director-general of national railways to complete arrangements with an American railroad company for the lease of 50 locomotives for service within Mexico. It is stated that some time ago the government received an offer from the above-mentioned American company for the rental of engines, instead of their sale.

The Mexican Government, as a means of affording a transportation outlet for a large tract of virgin timber land and to bring about the agricultural development of the intervening country, is constructing a railroad from Saltillo into the mountains, traversing a rich valley region for part of the distance. The new line will be about 40 miles long. The timber tract which it will penetrate is owned by E. E. Shaw of the City of Mexico and associates. James F. Martin & Co., of Saltillo, has the contract from the government to construct the railroad.

The Department of Communications and Public Works of the Mexican Government has announced that it has just granted a concession and awarded the contract for the construction of a railroad about 82 miles long between Toluca and Zitacuaro, in the state of Michoacan. Employment will be given to several hundred laborers in the building of the road. It will traverse a region that is rich in agricultural resources.

Applications filed by American and other foreign investment interests for concessions for the construction of electric and steam railroads and various other kinds of industrial enterprises are now pending with the Department of Communications and Public Works of the Mexican government. It is indicated by the attitude of the Carranza administration toward outside capital that these applications may all be rejected. The government has already adopted the policy of not granting any new concessions for the construction of additional lines of steam railroad. It has announced its intention of doing on its own account whatever railroad building may be deemed necessary, adding such lines to the National Railways of Mexico. Recently application was filed with the Department of Communication and Public Works for a concession to construct an electric interurban railway through the oil fields of the Gulf Coast region, connecting Tampico and Tuxpam. The proposed line would be about 120 miles long. No action has as yet been taken upon this application. American oil interests are back of the project.

SUPPLY TRADE NEWS

GENERAL

The Sims Improved Rail Anchor Company, Ltd., Toronto, Ont., has been incorporated to manufacture railroad machinery and other devices. The company is capitalized at $100,000 by Mervil MacDonald and Edwin Smily of Toronto, and others.

The William B. Scaife & Sons Company, Pittsburgh, Pa., has opened a Chicago sales and engineering office, in charge of **Charles F. O'Hagan,** chief engineer of the company at Pittsburgh, who has been appointed resident engineer and manager.

Samuel O. Dunn, editor-in-chief of the Railway Age, the *Railway Maintenance Engineer,* and other publications of the Simmons-Boardman Publishing Company, has been made also a vice-president of this company. His headquarters will remain at Chicago.

Mudge & Company, Chicago, opened a district office in the Railway Exchange building, St. Louis, Mo., on July 1, in charge of **Sherman C. Amsden,** assistant to president, who has been promoted to district manager of the Southwestern territory.

The Railway Motor Car Company of America, Chicago, is planning to construct a manufacturing plant at Hammond, Ind., at an approximate cost of $80,000. The building will be 300 ft. long by 100 ft. wide, 50 ft. of which will be two stories high. The superstructure will be of brick construction.

The Blaw-Knox Company, Pittsburgh, Pa., has opened branch offices in the Little building, Boston, Mass., and the Owen building, Detroit, Mich. **A. W. Ransome,** formerly in the New York office of this company, has been appointed New England manager, with headquarters at Boston, while **H. J. Desson** has been transferred from Pittsburgh to Detroit, where he will become manager of the Michigan district.

The Q & C Company, New York, manufacturer of supplies in the railway maintenance field, has formed a subsidiary company to market the Q & C piston rod packing and lubricator. This will be known as the Q & C Packing and Lubricator Company, with general offices at the same address and a factory at 70 Pearl street, Jersey City, N. J. **Charles F. Quincy,** president of the Q & C Company, is president of the new organization.

The Midwest Engine Company, Indianapolis, Ind., has opened new offices in the Florida Life building, Jacksonville, Fla., in charge of **D. J. Carrison,** formerly with the Busch-Sulzer Brothers Diesel Engine Company, St. Louis, Mo.; in the Caples building, El Paso, Tex., in charge of **Chester B. Loomis,** formerly consulting engineer and later major of engineers, of the Purchase, Storage and Traffic Division of the General Staff, U. S. A.; at 111 Broadway, New York, in charge of **B. H. Downing,** who for seven years has been engaged in the marketing of pumps and condensers; and in the Maison Blanche building, New Orleans, La., in charge of **J. R. Lowe,** who has been engaged in the marketing of prime movers and pumps for several years.

PERSONAL

George W. Jones, assistant manager of the New York office of the Pittsburgh Steel Company of Pittsburgh, Pa., has been appointed manager of the Chicago office, with headquarters in the McCormick building.

William H. Black, secretary of the **Standard Scale & Supply Company,** Pittsburgh, Pa., died at his home in that city on June 30, at the age of 57. Mr. Black was connected with the Standard Scale & Supply Company for over 20 years and

took a prominent part in the building up of the selling organization of that company.

T. J. Judson, Jr., formerly district manager of the **Chicago Pneumatic Tool Company** at Chicago, has been appointed manager of the pneumatic tool sales division, with the same headquarters, effective July 1.

David F. Jennings, Chicago representative of Guilford S. Wood, Chicago, died suddenly in New York City, on June 26, at the age of 64 years. Mr. Jennings had been Chicago representative for the past 14 years.

John McConnell, assistant vice-president of the Interstate Iron & Steel Company, Chicago, in charge of alloy steel production, with headquarters at Canton, Ohio, has been promoted to vice-president, with headquarters at Chicago.

L. C. Murray, who has been connected with the Carnegie Steel Company for many years, has entered the service of the **Blaw-Knox Company,** Pittsburgh, as a member of the selling force of the "Knox" department, with headquarters at Pittsburgh, Pa.

L. D. Winters, Chicago representative of the **W. S. Tyler Company,** Cleveland, Ohio, manufacturers of wire netting, has opened an office in the Peoples Gas building, where he will conduct a railway specialty business. Mr. Winters will continue to represent the W. S. Tyler Company as heretofore.

John J. Greer, president of the J. J. Greer Company, Kansas City, Mo., which operated commissaries on the Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific and news service on the latter road also, died suddenly at Pfister Hotel, Milwaukee, Wis., on July 19. He was about 60 years old.

Paul Kircher of the **Massey Concrete Products Corporation** has been promoted to resident manager of the Eastern district, with headquarters at 50 Church street, New York, this territory including Eastern Canada. **G. H. Redding** has been made resident manager in charge of sales in the Central district, with headquarters in Chicago, and **H. E. Burns** has been appointed resident manager in charge of sales in the Southwestern district, with headquarters in the Sumpter building, Dallas, Tex.

William B. Ross, assistant to the president of Mudge & Co., Chicago, with headquarters at Washington, D. C., has been appointed district manager of the same company, in charge of eastern sales, with headquarters at New York. Mr. Ross was born at Belfast, Ireland, on December 24, 1868. He came to America in April, 1889, and entered railway work with the Burlington, Cedar Rapids & Northern as a trucker and checker at Cedar Rapids, Ia. Later he was placed in the auditor's office, where he served in several capacities until December, 1892, when he was appointed timekeeper in the superintendent's office and later chief clerk. The next five years he was utility clerk to the vice-president and general superintendent and later car accountant. When the Burlington, Cedar Rapids & Northern was merged with the Chicago, Rock Island & Pacific in June, 1902, he became car agent and was later appointed statistician to the general manager of the system. In September, 1903, he was appointed transportation clerk to the third vice-president and subsequently held positions in the transportation and statistical departments of that road. In July, 1916, he resigned his railway position to become secretary and assistant treasurer of Mudge & Co., and the following April he was promoted to secretary and treasurer. In May, 1916, he was promoted to assistant to the president in charge of southeastern sales and the securing of priorities, etc.

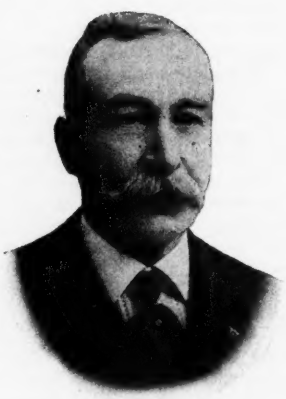
William B. Ross

C. C. Gibbs, until recently associated with the sales department of the Indianapolis plant of the National Malleable Castings Company, of Cleveland, Ohio, has been promoted to sales agent of the Cleveland plant, succeeding **J. H. Redhead,** who has been appointed assistant to the vice-president in charge of miscellaneous sales, with headquarters at Cleveland.

J. G. Carruthers, manager of sales of the Carnegie Steel Company, the Illinois Steel Company, and the Tennessee Coal, Iron & Railroad Company, with headquarters at Cincinnati, Ohio, has been appointed manager of sales for the Chicago district of the Illinois Steel Company at Chicago. He has been succeeded at Cincinnati by **George H. Vant,** who has been transferred from the Pittsburgh office of the Carnegie Steel Company.

E. E. Maher has organized the Maher Engineering Company, with office in the Michigan Boulevard building, Chicago, to handle the sales and installation of Erie Engine Works high speed engines, Sims feed water heaters, Dayton-Dowd centrifugal pumps, Wagener steam pumps and Pratt Engineering & Machine Company fertilizer and sulphuric acid machinery.

Arthur Osmore Norton, president of **A. O. Norton, Inc.,** Boston, Mass., died suddenly on June 8, in his home at Coaticook, Que. He was born on February 17, 1845, on a farm in Barnston township, about ten miles from Coaticook. The family moved to a farm in Coaticook when he was a small boy, and he began his business career as a clerk in the country store. When he was about 30 years old, he started a jewelry business in Coaticook, later doing a wholesale business, and subsequently was in the wholesale jewelry business in Boston under the firm name of Norton Brothers & Butters. In 1888, he started the manufacture of the Norton ball-bearing lifting jacks, produced in two factories, one in Boston and the other in Coaticook. Mr. Norton was the first to make non-fluid self-lowering jacks; he was also the pioneer in the making of ball-bearing screw jacks.



Arthur Osmore Norton

TRADE PUBLICATIONS

Ventilators.—Merchant & Evans Company, Philadelphia, Pa., has issued a 16-page booklet devoted to general remarks on ventilation and a particular description of the "Star" ventilators, pointing out its adaptations to various requirements. The booklet is well illustrated and well gotten up, giving a comprehensive idea of the possibilities of this type of ventilator.

Reinforced Concrete Products.—The Massey Concrete Products Corporation, Chicago, has issued a general catalog for 1919 relative to the concrete pipes, slabs, piles, poles, posts, battery wells, buildings, etc., manufactured by this company. The booklet is well illustrated with photographs, drawings and tables. This general catalog is a forerunner of a series of supplements containing more detailed information about the individual products. The first two of these, on railway culvert pipe and on pipe for highway culverts and sewers, will be ready for distribution shortly.